

CENTRAL AND SOUTH AMERICA



VALPARAISO.

Descriptive Geographies from Original Sources

CENTRAL & SOUTH AMERICA

WITH THE WEST INDIES

SELECTED BY

F. D. HERBERTSON, B.A. (Lond.)

EDITED BY

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PREFACE

THE modern teaching of geography, like that of history, lays increasing stress on the value of original authorities. One of the first steps in this direction was the bibliography appended to Sir Archibald Geikie's *Teaching of Geography*, followed in 1897 by Dr. H. R. Mill's *Hints to Teachers and Students on the Choice of Geographical Books*, compiled at the request of the Geographical Association. The present series goes a step further, and attempts to depict the world in the language of men who have seen it. The difficulties of the task of selection, and of avoiding either deficiency or redundancy, have been exceedingly great. Many excellent extracts have had to be rejected on account of their length, or because they dealt with matters of secondary importance, or, still more often, because an individual author was already too fully represented. In several cases a certain amount of condensation has been necessary. This has been effected by omission where necessary.

It is hardly necessary to say that the series is intended as a stimulus to, and not as a substitute for, individual reading, and to this end a number of additional references are given without quotation, and a somewhat full bibliography is appended. From almost every book and paper included, a large number of excellent supplementary passages could be made. With regard to the best method of using the series, the editors do not presume to dictate to teachers, but for those who may wish to use it as a class-book an introduction is prefixed, summarising the

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geography of each continent and referring for fuller details to the illustrative passage.

The editors desire to express their very great indebtedness to the authorities of the Royal Geographical Society, the Royal Scottish Geographical Society, the Manchester Geographical Society, the American Geographical Society, and the (American) National Geographic Society, for permission to make use of their journals, which are practically unexhaustible mines of the most recent and trustworthy information, and of which at least the British ones should be in the hands of all teachers of geography; to Lord Brassey for permission to quote from the works of Lady Brassey; to Mrs. M. G. Mulhall for permission to quote from her own works and those of her late husband; and to Mrs. J. G. Frazer, Sir Clements R. Markham, Col. G. E. Church, W. H. Hudson, Esq., Hesketh Prichard, Esq., F. Vincent, Esq., and Edward Whymper, Esq.; to Professor R. E. Dodge, editor of the (American) *Journal of School Geography*, for permission to quote from that journal; and to Messrs. Sampson Low, whose many standard books of travel form a library in themselves; Mr. D. Appleton (New York), Mr. Edward Arnold, Messrs. A. and C. Black, Chapman and Hall, Dent, Harper Brothers, Messrs. Hurst and Blackett, Longmans, Macmillan, Mr. John Murray, Messrs. G. Philip and Son, Messrs. Putnam (New York), Mr. Edward Stanford, and Messrs. Ward and Lock, for permission to quote from copyright works published by them. The editors have written to the author of every paper cited from the journals of the Royal Geographical Society and the Royal Scottish Geographical Society; wherever it was found possible to communicate with the author the desired permission was readily granted. For all these permissions, and for the many kind expressions of interest which have accompanied them, the editors desire to express their sincere thanks. The obligations are formally acknowledged at the end of each extract.

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INTRODUCTION

CENTRAL AMERICA

CENTRAL AMERICA is joined to North America by the isthmus of Tehuantepec (130 miles wide, 390 feet high), and to South America by the isthmus of Panama (31 miles wide and 285 feet high).

Central America consists of a narrow neck of land nearly 1200 miles in length, from which two great peninsulas jut out to the east in the direction of the West Indies. Yucatan, the northern, is separated from Cuba by the Yucatan Channel; Honduras, the southern, is separated from Jamaica by a wide and shallow sea, above which rise several submarine banks. These peninsulas define three great gulfs—Campeche or Campechy in the north, Honduras in the centre, and Mosquito in the south.

The western mountains are continuous from Tehuantepec to Panama except for one rift, in which are Fonseca Bay, Lakes Managua and Nicaragua, and the river San Juan. They have a mean height of between 6000 and 7000 feet, rising to over 13,800 feet in Tajumulco, and contain many active volcanoes (Fuego, 12,580 feet, and Chiriqui, 10,150 feet). The Honduras peninsula is mountainous, with ranges and rivers running from west to east, but it is bordered by a low, swampy, forested coastal plain, known on the east as the Mosquito coast. The same type of coast, but wider, surrounds the low Yucatan peninsula, which resembles Florida.

Central America lies wholly between the tropics, and the variations in climate and vegetation are due to difference of

elevation. The hot lands (*tierra caliente*) of the coastal plains, fertile but malarial, are covered with dense tropical forests, which produce rubber, mahogany, and coco-nuts, as well as many other tropical species. The rainfall is great and almost continuous.

Cacao is cultivated on the lower slopes of the mountains, especially in the west. Bananas, cotton, and other tropical plants are grown. The temperate lands (*tierra templada*) range from 2000 feet to 6000 feet. They are forested in the rainier, and grass-covered in the drier regions. In this zone coffee and tobacco do well. Above 6000 feet are the cold lands (*tierra fria*), with deciduous forests and wheat and potato fields in the lower, and coniferous woods in the higher regions, on which snow occasionally falls.

People and Political Divisions.—A minority of the inhabitants are Spanish, but the majority are Indians or half-breeds.

Yucatan and Tehuantepec form part of Mexico (see volume on *North America*). Round Honduras Bay are British Honduras, Guatemala, and the Honduras Republic, which reaches the west coast at Fonseca Bay. To the north is Salvador, to the south Nicaragua. Costa Rica lies south of the San Juan River. The Panama isthmus forms part of the South American republic of Colombia.

British Honduras (7500 square miles, 40,000 inhabitants, less than 500 whites) is a hot, moist, malarial, densely forested region, producing mahogany, logwood, rubber, coco-nuts, and bananas, which are shipped from Belize (see pp. 42-45).

Guatemala (48,000 square miles, 1,850,000 inhabitants, one-sixth white) is very mountainous, with a narrow, coastal plain in the west. On this plain is built the port of San José (see p. 52), from which a railway climbs across the volcanic range to Guatemala City (72,000) (see p. 38), and across many hills and valleys to Puerto Barrios on the Gulf of Honduras, the Atlantic port of the republic. North of the city of Guatemala is a fertile plain, of which Coban (30,000) is the chief town.

Salvador (7225 square miles, 1,000,000 inhabitants) is a small republic on the Pacific slope of the isthmus, famous for its coffee, sugar, cochineal, indigo, and vanilla, which are shipped from La Libertad, the port of San Salvador (60,000), the capital. Santa Anna (48,000) lies further north, amid fruitful coffee and sugar plantations.

●

Honduras (46,000 square miles, 500,000 inhabitants) greatly resembles Guatemala. It has a short coast line on the Fonseca Gulf of the Pacific, with the port of La Brea, and a long one on the Atlantic, with the ports of Cortez (Caballos) and Trujillo. It is especially rich in forests. The land is fruitful, but little cultivated. In addition to other Central American crops excellent tobacco is grown and cattle are reared. Tegucigalpa (35,000), the capital, is the largest town, in the heart of the country.

Nicaragua (49,000 square miles, 500,000 inhabitants) consists of three very different parts—the volcanic and lake region of the west, the hilly centre, and the low plains of the Mosquito coast on the Atlantic. Coffee, cacao, sugar, bananas, temperate cereals, and cattle thrive in the west. The eastern forests are famous for mahogany, dyewoods, and drugs (ipecaecuanha, sarsaparilla, etc.). Pottery, mats and other articles of ordinary use are manufactured at Leon (34,000), Managua (35,000), on Lake Managua, the capital, and Granada (35,000), on Lake Nicaragua, all joined by a railway which terminates at Corinto, the Pacific port (see pp. 39-47).

Notwithstanding the volcano Omotepe, which rises out of Lake Nicaragua (see p. 47), it was proposed to utilise the lake as part of an inter-oceanic canal, which was to descend by locks from near Rivas to Brito on the Pacific, and to San Juan del Norte or Greytown on the Atlantic, by the San Juan River, locks, and a canal (see p. 48). The *Mosquito coast* is so called from the Mosquito Indians. Blowfields (5000), on the Blowfields River, is the chief centre of this region, of which bananas and mahogany are the chief products (see pp. 42-45).

Costa Rica (18,500 square miles, 335,000 inhabitants), the most southerly of the Central American republics, is crossed almost from west to east by a double volcanic range, in whose fertile soil almost any plant can be grown at a suitable altitude. Next to coffee, the chief products are bananas, rice, maize, sugar-cane, and beans. San José (25,000), the capital, in the centre of the republic, is connected with the Pacific port of Punta Arenas (5000), on the Nicoya Gulf, and with Limón (4000), the Atlantic port (see pp. 49-53).

The *Panama* railway and canal cross the isthmus in Colombian territory. Colon (Aspinwall), on an island (see p. 54), is the northern or Atlantic port, and Panama the southern

or Pacific port. Both canal and railway follow the course of the river Chagres, which is subject to heavy floods in the rainy season. This, and the great cutting necessary to cross the divide, together with the unhealthy climate, are the chief difficulties in the construction of the great canal (see pp. 54-56).

THE WEST INDIES

The West Indies lie between Yucatan, Florida, and the delta of the Orinoco.

Configuration.—In the north three lines of heights run from the three peninsulas, the Bahamas from Florida, Cuba from Yucatan, and Jamaica from Honduras, two passing through the north and south of Hispaniola, and all converging on Porto Rico (Puerto Rico). From Porto Rico the chain of the Lesser Antilles runs to Trinidad and the Paria peninsula of South America.

The Bahamas are low coral islands rising above a submarine bank, shallower in the north than in the south, and bounded on all sides by deeper seas.

The four islands of the Great Antilles are Cuba, Jamaica, Hispaniola, separated from them by the Windward passage, and Puerto Rico, separated from Hispaniola by the Moira passage. They are mountainous islands, rising out of very deep seas, one deep, south of Cuba, being over 20,000 feet. The highest point, Loma Tina in Hispaniola, is over 10,000 feet. The greatest extent of lowland is in Central and Western Cuba.

The Lesser Antilles are much smaller islands, consisting of lofty volcanic peaks, or less elevated limestone plateaus, the former occurring in the western, the latter in the outer or eastern chain, which is traced in the eastern half of Guadeloupe and Barbadoes.

Climate and Vegetation.—The West Indies are all in the hot zone, at sea level, but most of them are high enough to have temperate uplands. The sea-breeze ameliorates the climate and makes it healthier than that of most regions in similar latitudes. Rain falls chiefly in late summer and autumn, and is more abundant on the eastern than on the western slopes.

The coral islands are inferior in fertility to the volcanic islands, which are among the richest lands in the world.

Dense tropical forest covers much of the lowlands. Sugar, cacao, bananas, pine-apples, and other tropical products are cultivated in the clearings. At higher elevations both forest and cultivated produce are of a more temperate type.

People and Political Divisions.—After their discovery by Columbus in 1492 the original Carib inhabitants were soon exterminated, and the islands were occupied by Spanish, English, and other European colonists, who introduced African negroes to cultivate their plantations. The population to-day consists of Creoles, or pure whites born in the tropics, pure negroes, and half-breeds.

Cuba is a protectorate and Porto Rico a dependency of the United States of America. Hispaniola is divided between the French-speaking negroes of the republic of Haiti and the Spanish-speaking negroes of the republic of Santo Domingo. To Britain belong the Bahamas, Jamaica, the Leeward and Windward Islands of the Lesser Antilles, Barbadoes, and Trinidad. Guadeloupe, Martinique, and some small islands are French, including half of St. Martin. Saba, St. Eustace, and the other half of St. Martin are Dutch. St. Croix and the Virgin Islands, St. Thomas and St. John, are Danish.

The United States Dependencies

Cuba (45,000 square miles with adjacent keys—population in 1899, 1,900,000), the largest of the Antilles, has nine-tenths the area of England. It is a long, narrow island, over 700 miles in length, and from 25 to 100 miles in breadth, with a coast-line of 2000 miles, bordered by coral reefs. In the west rise the Organos Mountains, with the famous tobacco plantations on their southern slopes. The centre of the island is hilly, limestone land, where sugar is grown. In the east the Sierra Maestra rises to over 6000 feet, close to the south coast, and is rich in iron (see p. 2). The limestone plateau to the north of this range is cut into deep gorges. A large area of the southern coast is swamp (see pp. 2, 3).

The inexhaustible forest wealth of Cuba is described on pp. 3-6. Sugar and tobacco are extensively cultivated, the former in the centre, the latter in the west, and Havana cigars are famous throughout the world.

Havana (Habana) the capital (425,000) is built round a fine harbour on the north coast (see p. 6), and with Cienfuegos, on the south coast, is the outlet for sugar and tobacco. Santiago de Cuba (328,000), on a fine land-locked harbour, is the port of the Sierra Maestra region (see p. 7).

Porto Rico (Puerto Rico) (3700 square miles, 100,000 inhabitants, of whom 62 per cent are white and only $6\frac{1}{4}$ per cent pure negroes) is a compact island, 35 miles broad, and nearly 100 miles long. It is very mountainous (Yunque, 3600 feet) (see p. 19). Cattle thrive on the grass lands of the upper hill slopes, on which some forest still remains. The plains and valleys are cultivated with sugar, coffee, and tropical fruits and vegetables for local use. The capital is San Juan (32,000), on the north coast. Ponce (28,000), on the south, is also a frequented port.

Hispaniola

Hispaniola (native name Haiti, or rugged land) is divided into the republics of Haiti and Santo Domingo.

Haiti (10,000 square miles, 1,425,000 inhabitants, about 2000 white), the western republic, consists of two peninsulas and the valley of the Artibonite between them. Cape Haitien (29,000), in the north, and Port au Prince (70,000), the capital, in the north-west of the southern peninsula (see p. 18), are the chief towns.

The fertile island is rich in mahogany, blue wood, and other timber trees. Timber, coffee, and cacao are exported to some extent; but the negro population has little enterprise beyond the satisfaction of its simple wants.

The Dominion Republic (18,000 square miles, 416,000 inhabitants, mainly half-breeds) occupies the western two-thirds of the island, the most fertile part of which is the Yagui valley, in the north, where coffee, tobacco, sugar, and cotton are grown. Puerto Plata (5000) is the northern, and Santo Domingo (25,000 (Hill)), the capital, the southern port.

British West India

Jamaica (4200 square miles, 825,000 inhabitants) is distant about 100 miles from the south of Cuba and from the west of

Hispaniola. It is a partly reef-bound island, 150 miles long and 50 miles broad. Flat in the west, it rises gradually to the height of 7400 feet in the Blue Mountains in the east (see pp. 8, 9). It is an island of rivers, as the native names indicate (see p. 11), flowing in fertile valleys. Railways run from the capital, Kingston (47,000), in the south (see p. 12), to the northern ports, Port Antonio and Montego (4800), from which bananas (see p. 10) and other fresh fruits are exported to the United States, and more recently to Britain. Vegetation is very rich (see p. 11). Sugar, formerly the staple, is still grown, and gives rise to the manufacture of rum and molasses. Coffee is cultivated on the Blue Mountains, on which cinchona trees flourish at a higher elevation. Allspice, or pimento, is grown in the west. Ginger, arrowroot, tobacco, and cacao are also cultivated (see pp. 9, 10).

The *Cayman Islands* and some small guano-yielding keys belong to Jamaica.

The *Turks and Caicos Islands* (230 square miles, 5250 inhabitants), the south-eastern islands of the Bahamas, are politically dependencies of Jamaica. Salt is obtained by evaporating ocean water, sponges are fished for, and some sisal hemp is grown.

The *Bahamas* (29 large and about 3000 small islands, 5400 square miles, 60,000 inhabitants) are low coral islands, lying to the north of Cuba. They include the Turks and Caicos Islands (230 square miles, 5250 inhabitants), which are politically dependent on Jamaica. Sponges, salt, and hemp are the chief products. Pine-apples and oranges are cultivated for the American market. Some of the islands are wooded, but most are barren or covered with cactus and other arid plants. The capital, Nassau (11,000), on New Providence, an island nearly the size and shape of the Isle of Wight, is a British naval station (see p. 1).

The *Leeward Islands* is the official name of the British islands lying between the Virgin Islands and Dominica. Among the islands included are the low Anguilla and Barbuda, and the high volcanic St. Kitts, Antigua, Montserrat, and Dominica. Anguilla and Barbuda are noted for phosphates. Antigua (see p. 20) produces pine-apples and sugar. The capital is St. Johns. Sugar and lime juice are the chief products shipped from Montserrat (see p. 22). Capital and port,

Plymouth. Dominica is a picturesque island (see p. 25), rising over 5000 feet, with an active volcano, the Grand Soufrière.¹ The French-speaking inhabitants cultivate sugar, coffee, cacao, and limes, exported from Roseau, the capital.

The Windward Islands.—Santa Lucia, St. Vincent, the Grenadines, and Grenada are fertile, picturesque, mountainous, volcanic islands, in which sugar-cane, cacao, and spices are grown, except in Grenada, which produces no sugar. Nearly all the inhabitants are negroes. Santa Lucia (see p. 27) is a French-speaking island, with the best harbour of the West Indies, Castries, a British naval station.

Barbadoes (166 square miles, 200,000 inhabitants), a low limestone island bordered by a coral reef, supports a dense negro population, engaged in the cultivation of sugar (see p. 28). Bridgetown (21,000 in 1891) is the capital and is growing.

Trinidad and Tobago (1870 square miles, 280,000 inhabitants). Tobago (see p. 28) is a small volcanic island producing sugar and coco-nuts. Trinidad is bordered north and south by hills which jut into peninsulas, and continue the Venezuelan Andes (see p. 31). The Gulf of Paria is almost land-locked, and on its Trinidad shores are Port of Spain (5000) and San Fernando, joined by a railway which passes through fine sugar and cacao plantations, and runs to the Pitch Lake (see p. 33), from which asphalt is obtained.

French West Indies

Guadeloupe (580 square miles, 185,000 inhabitants) consists of a lofty volcanic western part called Basse Terre, and a flatter limestone eastern part called Grande Terre, between which is a narrow strait, the Rivière Salée. Sugar and coffee are grown. The capital town is Basse Terre, and the chief port Pointe-à-Pitre. Half of *St. Martin* and a number of smaller islands are attached to Guadeloupe.

Martinique (380 square miles, 185,000 inhabitants) is a very fertile and prosperous volcanic island producing sugar, coffee, cotton, tobacco, and cacao. Capital, Fort de France (27,000); chief port, St. Pierre.

¹ Soufrière is a common name for a volcano in the West Indies (see pp. 21, 23, 27).

The Dutch West Indies

St. Eustache, Saba, and half of St. Martin, are Dutch, and are attached to the colony of Curaçao.

The Danish West Indies

St. Croix, St. Thomas, and St. Johns are small sugar-producing islands, which will probably eventually be sold to the United States of America.

SOUTH AMERICA

South America lies south of the Isthmus of Panama, and almost entirely east of North America. The extreme west and east points, 3200 miles apart, are Punta Parina, south of the Gulf of Guayaquil, 81° W., and Cape Branco, south of Cape San Roque, 35° W. The extreme northern and southern points of the mainland, 4600 miles apart, are Punta Gallinas, $12\frac{1}{2}^{\circ}$ N., and Cape Froward on Magellan Strait, $53\frac{1}{2}^{\circ}$. Cape Horn (Hoorn), 56° S., though not on the mainland, is generally called the extreme southern point. The area of South America is nearly 7,000,000 square miles (2 Europes, 140 Englands).

South America is very compact, with few great indentations, peninsulas, or islands.

The coast is regular except in the south-west, where it is broken into fiords and fringing islands. The Gulf of Guayaquil, in the west, and the gulfs of Darien, Maracaibo, and Paria, in the north, are cut between ranges of the Andes. The Gulfs of Bahia and Rio de Janeiro are magnificent harbours at the edge of the Brazilian Highlands. To the south are a number of lagoons, the vast estuary of the Plate, and the gently curved gulfs of Blanca, San Matias, and San Jorge. Magellan Strait cuts off the island of Tierra del Fuego; 260 miles to the east are the Falkland Islands. The Galapagos Archipelago (see p. 226) lies 700 miles west of South America on the equator.

Configuration.—About two-fifths of South America is a vast plain, less than 600 feet above the sea, drained by the Orinoco, the Amazon, and the rivers flowing to the Plate. To the east rise the Guiana and Brazilian Highlands, and to the west the vast and complicated mountain system of the Andes. °

The Western Cordillera or Andes.—From the Gulf of Paria to Cape Horn the Andes form an almost unbroken mountain barrier, 6500 miles long. In the north they curve in a great semicircle to Arica, south of which they run almost due south, curving to the east again beyond latitude 50° S.

The Northern Andes of Venezuela and Columbia form three chains, the oriental, central, and occidental (see p. 163), which converge at the knot of Pasto, just north of the equator (see p. 164). Between them the Magdalena (see p. 165) and its tributary the Cauca (see p. 165) flow in deep longitudinal valleys, and then across a flat plain to the Caribbean Sea. To the east the snow-covered Sierra Nevada de Santa Marta rises to 17,500 feet (see p. 169), east of which is the Goajira Peninsula, forming the northern side of the Maracaibo Gulf.

A continuous mountain chain runs parallel to or near the Pacific coast, from the knot of Pasto to Magellan Strait. In the north several plateaus and passes lie between 7000 and 10,000 feet, near where the Marañon (Amazon) turns eastwards from the mountains, but south of this no pass is lower than 13,000 feet until the Uspallata (see p. 211) or Cumbre (12,800 feet), at the base of Aconcagua (23,080 feet), the highest mountain in South America. The range is a great barrier to communication, but nevertheless railways have been constructed across it which are among the engineering wonders of the world. The chief are the lines from Lima to Oroya, across a pass 15,650 feet high; from Mollendo by Arequipa, round the volcano El Misti (18,000 feet), over a pass 14,660 feet, to Lake Titicaca (see pp. 190-95); and another to the same lake from Antofagasta (see p. 207), over a pass of about the same height. South of the Uspallata Pass, formerly a mule track and now also the modern railway route between Chile and the Plate, the chain is lower. The gap at Nahuel-Huapi Lake is under 5000 feet, and to the south few summits are over 10,000 feet.

West of the Pacific chain are numerous disconnected *coastal ranges*, separated from it by valleys which are fertile in the rainy regions north of the equator (e.g. the Atrato valley, and the valley of Western Ecuador, partly drained by the Guayas and filled with a fine reddish clay-earth of great fertility). From the Gulf of Guayaquil to Arica this furrow is absent, but south of the latter it forms the Antofagasta and Atacama

deserts of Northern Chile (see p. 207). South of Aconcagua, where the rainfall becomes abundant, it is represented by the fertile valley of Chile, 30 miles wide (see p. 198). From 42° S. this valley is submerged, and forms the channel inside the islands of Chiloe, Chonos, Queen Adelaide, and other archipelagos, which fringe the fiord coast.

East of the Pacific or main chain the mountains are more complex. In Ecuador is the lofty plateau of Quito, above which rise great volcanoes, active and extinct, including Chimborazo (20,500 feet) in the west, and Cotopaxi (19,500 feet) in the east. The east ranges descend to the low plateau of Loja, in a line with the main stream of the Amazon. South of this plateau, in Peru, are long valleys, drained by the Marañon and Ucayali and their tributaries, separated by long and lofty ranges, which converge to and then diverge from the knot of Pasco.

In Southern Peru a line of higher ground running northwards from near the volcano El Misti forms the northern boundary of the lofty plateau of Bolivia, a region of internal drainage to Lakes Titicaca (see p. 194), at an elevation of 12,500 feet, and Poopo or Aullagas. The Andean system is here broadest—about 500 miles. The eastern margin of the plateau is formed of many ranges running from north-west to south-east in the north, and from north to south in the south. East of the Titicaca region, known as the Puna (see p. 194), are lofty volcanoes such as Sorata (21,700 feet) and Illimani (21,200 feet). A southern outlier of the eastern ranges is the Sierra de Cordoba in Argentina. South of Aconcagua a low broken chain, the Pre-Cordillera of Argentina, is separated by a longitudinal furrow from the higher Pacific or main chain. The great divide mainly follows the Pre-Cordilleras, but in some cases coincides with the main chain, in others extends to the Patagonian plain to the east.

The *Patagonian plateau* lies east of, but is not part of, the Andes south of 40° S., with numerous low ranges. It is crossed by the Chubut River, and its northern boundary is indicated by the rivers Negro and Colorado. Between the Colorado and the Plate is a fertile lowland, above which the Ventana and Tandil rise to about 3500 feet, and round which a broad band of sand-dunes borders the sea.

The Plate Lowland lies between the Andes and the Brazilian

Highlands, both of which give rise to the rivers flowing to the Paraguay, Parana, and to the Uruguay.

The Brazilian Highlands are highest near the east coast, and slope gradually to the west. From Cape Frio a line of higher ground runs north-west in the Minas Geraes, Goyaz, and Matto Grosso plateaus, and forms the divide between Parana and Paraguay, flowing to the south, and the São Francisco (see p. 113), Tocantins, and the tributaries of the Amazon flowing to the north.

The highest summit is Itatiaia (about 9000 feet) in the Mantiqueira range, which is separated by the fertile Parahyba Valley from the coastal Serra do Mar, the southern spurs of which enclose the magnificent harbour of Rio de Janeiro (see p. 118). Here the "forested mountains are grouped in wild confusion, presenting some of the most beautiful scenery in the world."

The Amazon Lowland is narrowest near the mouth of the river, but widens to the west, where the indefinite divides between the Amazon and Paraguay in the south and the Orinoco in the north are little over 600 feet. All the rivers form a series of rapids before they reach this lowland.

The Guiana Highland (about 16 to 18 times the area of England) used to be called the Island of Isabel, because it is completely bounded by water, the sea in the north, the Orinoco in the west and north-west, the Cassiquiare branch of the Orinoco, which flows into the Negro and on to the Amazon, on the south-west and south. "A tortuous low chain of mountains, running roughly east and west, cuts it into two nearly equal parts: the northern is saturated and river-torn; the southern is, in general, thirsty and semi-barren."¹ The slope from the north is gradual to the divide, from which the steep scarps of the Parima, Pacarima, and Tumac Humac plateau descend to the Amazon plain. The highest regions are probably Icutu (11,000), and the Roraima plateau (8700 feet) (see p. 79).

The Orinoco Lowland is much smaller than the other two, and averages about 300 miles broad. Like that of the Amazon it widens from the sea inland. In the wet season parts of it are covered with water, but round the lower llanos, low terraces rise to the base of the mountains (see pp. 72-78).

¹ Col. G. E. Church, *Geographical Journal*

Rivers.—Over three-fifths of South America is drained by the Amazon (2,720,000 square miles), the Plate River (1,200,000 square miles), and the Orinoco (365,000 square miles). The other rivers of consequence are the Magdalena (see p. 165), draining the Columbian Andes, the Parnahyba and São Francisco (see p. 113), draining the eastern Brazilian Highlands, and the Colorado, Negro, and Chubut rivers of the south.

A number of rivers never reach the sea, and the inland drainage area is 105,000 square miles. The most important of these are the Desaguadero, between Lakes Titicaca and Poopo on the Bolivian plateau, and the Salado and other rivers, which disappear on the dry plains of Western Argentina. The western deserts have no rivers.

The *Amazon* flows a little south of the equator, and its longest tributaries, the Madeira, Purus, Tapajos, and Tocantins, come from the south. Its waters are highest, therefore, during the southern rainy season. The northern tributaries, the Iça, Yapura, and Negro, however, bring much rain in the northern rainy season.

The Amazon is so called below the united Marañon and Ucayali rivers, which rise in the Andes. It is navigable to the Pongo de Manseriche, where the Marañon issues from the mountains in a deep gorge. All its great tributaries are navigable to the fall-line, some above it—the Madeira, the most important of all, to the base of the Bolivian Andes.

The Amazon does not form a delta, but a great estuary, up which the tides rush with a roar and form a great bore dangerous to shipping. Most vessels enter the river by the Para River (see p. 108), south of the island of Marajo, into which the Tocantins, with its greater tributary, the Araguaya, pours.

(For the Amazon and its tributaries see pp. 92-102.)

The *Orinoco* is entirely in the northern hemisphere, but so near the equator that two rainy seasons are separated by a short dry one at midsummer. It rises in the Sierra Parima and divides into two branches, the southern or Cassiquiare forming a broad stream which enters the Rio Negro. The northern one curves round the eastern base of the Guiana Highlands, and receives long navigable tributaries from the Andes—the Guaviare, Meta, and Apuri (see pp. 72-74).

The *Plate* basin receives most rain in the southern summer

The Paraguay rises in Matto Grosso, near the sources of the Guapore (Madeira) and Tapajos, and flows due south. The upper reaches have rapids, but it is navigable from the Cuyaba for light steamers. It receives the long but shallow Pilcomayo and Bermejo from the Andes, and then joins the Parana. The Parana flows 1600 miles south-westwards through the Brazilian Highlands (see p. 115), receiving many rivers from the mountains bordering the east coast, all broken by rapids. The united Paraguay and Parana winds across the plain with many interlacing branches to the Plate estuary (see p. 126). The Uruguay drains the southern part of the Brazilian Highlands also to the Plate estuary, which receives more water than is discharged by the Mississippi in North America.

Climatic and Vegetation Regions.—The Western Cordilleras form a great climatic barrier like that of the western mountain system of North America. It is high enough for the snow-line to exist at all latitudes.

North of the tropic of Capricorn the three belts of hot, temperate, and cold regions (*tierra caliente*, *tierra templada*, *tierra fria*) (see p. xiv) are found at heights averaging about 3000, 6500, and 10,000 feet. Above 10,000 feet are the treeless *paramos*.

The plateaus between 15° and 30° S., where the range is broadest, lie about 2 miles above the sea. This region, known as the Puna, has considerable ranges of temperature and is arid.

The west coast consists of four very different regions. North of Guayaquil the rainfall is heavy, and the plains and lower mountain slopes have dense forests. The Atrato River is said to carry relatively more water to the sea than any other. Bamboos, coco-nuts, and other palms, and india-rubber, abound in the lower lands, and the useful cinchona on the higher slopes.

From 5° to 30° S. the lower land is dry all the year round. The Andes bar the trade-winds, and the winds from the Pacific blow for only short distances over a sea cooled by the upwelling of waters from lower depths. In winter, however, thick mists are common in Peru. The Antofagasta and Atacama deserts (see p. 207) are rich in nitrates, used for fertilising poor soils.

The Chilean valley resembles California in its mild temperatures and winter rains. South of about 37° S. rain falls at

most seasons. Many fine timber trees grow in the forests, where the prickly auracaria (often called the puzzle-monkey tree) has its home.

The extreme south of the Andes, in latitudes corresponding to those of Ireland, is cold and bleak, with severe storms of wind, rain, or snow. Pine woods abound.

Patagonia, which corresponds to France in latitude, has a relatively cold and arid climate. The central plains have few plants, mainly thorny scrub, and here and there are covered with dunes, but along the river-courses and at the base of the Andes they are more fertile (see p. 157).

The pampa of the Plate (see p. 145) is dry in the west, where there are many salt basins, but in the east, where the summer rains are more abundant, grass flourishes and the prairies are cultivated. To the north the woodlands of the Gran Chaco, the Great Hunting Ground (see p. 143), are a transition to the dense forests of the Amazon basin.

The Brazilian Highlands are dry in winter but wet in summer, except in the São Francisco valley. They are covered with open woodlands—the *campos* and *catangus*—which become denser in the valleys.

The Amazon Valley is one of the wettest regions in the world, and is a region of almost impenetrable forest, or *selvas*, with dense undergrowth, innumerable lianas, and a thick leafy overgrowth. An excellent description of the vegetation of the Amazon forests will be found on pp. 97-99.

The Guianas are similarly wooded in the north, but arid on the southern or Brazilian slope.

The llanos or savanas of the Orinoco (see p. 75) are grass lands receiving heavy summer rains, but exceedingly dry during the rest of the year.

Animal Regions.—East of the Andes the main barriers to the distribution of animals are the different climatic conditions, and these are chiefly differences of moisture. Hence the animals of South America are widely distributed. They, however, form a distinct animal realm when the West Indies, Central America, and the low coastal regions bordering Mexico are added. The American "lion" (*puma*) and "tiger" (*jaguar* or *ounce*), tapir, peccary, armadillo, opossums, the camel-like llama, the guanaco, and alpaca of the Andes (see p. 185), are among the mammals. The American ostrich or rhea, condor

(see p. 225), toucan, birds of paradise, the humming bird, many lizards, the boa-constrictor, vampires, and other bats and innumerable insects, are found. References to these will be found in many of the extracts.

Races.—The total population is estimated at 38,000,000. The Andes and western regions were formerly peopled by the civilised Quichua in the centre and the sturdy Araucanians in the south, who still form the bulk of the population, either pure or mixed with Spanish blood. Many uncivilised tribes live in the forest regions to the east (see p. 104). In Brazil and the Guianas negroes and, in the latter, also coolies from India have been introduced to till the ground. The Spaniards conquered the Andes and the Plate basin, and their language and customs still survive among their pure and mixed descendants. In Brazil Portuguese, and in the Guianas French, Dutch, and British are the predominant races, but few Europeans live permanently in the Guianas.

Political Divisions.—In the nineteenth century Spanish-speaking republics were formed in Venezuela, Colombia, Ecuador, Peru, Bolivia, Chile, Argentina, Paraguay, and Uruguay, stimulated by the struggle for freedom of the United States and France at the end of the eighteenth century, and modelled on the constitution of the former. Brazil is also a Federal Republic, and only the British, Dutch, and French Guianas and the British Falkland Islands are European dependencies.

Venezuela (about 365,000 square miles and 2,600,000 inhabitants) occupies part of the rich grassy llanos of the Orinoco, and the western slopes of the Guiana highland, where gold is found. Ciudad Bolivar (12,000), on the Orinoco, is the chief town in this part, great in possibilities but still little utilised. The most important regions are in the Andes Mountains, round the cities of Caracas (72,000), the capital (see pp. 67-70), and Valencia (40,000), where coffee and cacao are grown (see p. 45). Caracas lies in a fertile plain encircled by hills, over which a railway (see p. 69) zigzags to La Guayra (12,000) on the Caribbean Sea (see p. 67).

Maracaibo (35,000) is the commercial centre in the west, built between the lagoon and gulf of that name.

Colombia (about 500,000 square miles, and 4,300,000 inhabitants) consists of the three northern ranges of the Andes,

of the plains of the lower Magdalena, Cauca (see p. 165), and Atrato rivers, and the Isthmus of Panama. All kinds of plants can be cultivated, from bananas, cacao, and sugar on the plains, and coffee on the lower slopes, to wheat and temperate cereals and fruits on the *tierra templada*, while cattle flourish on the llanos to the east. Gold, silver, emeralds, iron, coal, and other mineral products are found, especially round Medellín (60,000).

Puerto Colombia, the seaport, and Barranquilla (40,000), the river-port, command the trade of the Magdalena River and its tributaries, by which most goods are transported to and from the capital, Bogotá (120,000), on a high plateau of the same name (see p. 167) in the oriental chain, to which it is proposed to construct a railway. Cartagena was formerly the chief port of the Indies, the headquarters of the Spanish galleons.

Ecuador (about 116,000 square miles, and 1,300,000 inhabitants) consists of (1) the rich basin of the Guayas, with cacao plantations, at the southern end of which is the port of Guayaquil on the gulf of the same name (see p. 181); (2) the Andean plateau (see pp. 172-74), producing cereals for local use, with Quito (80,000), built 9000 feet above the sea, near the foot of Cotopaxi, almost on the equator; (3) the densely-forested plains east of the Andes (see p. 174).

Peru (about 700,000 square miles, and 4,000,000 inhabitants, of whom 14 per cent are white and 38 per cent pure Indians) consists of the Andes from the Gulf of Guayaquil to Lake Titicaca (see p. 194), the basins of the Marañon and Ucayali and the Upper Amazon. The west coast region is dry desert (see p. 183), but crossed by many streams from the mountains, whose waters irrigate sugar and cotton plantations and vineyards.

Lima (130,000), the capital, on the Rimac, founded by Pizarro, is a city of sun-dried brick, and is joined by rail to its port, Callao (31,000), one of the most important on the Pacific coast (see p. 187). The railway is continued over the Andes to Oroya, and is to be prolonged to Cerro de Pasco (13,000) at 13,200 feet, an important silver-mining centre (see p. 190). Numerous small ports exist, but Mollendo in the south is important as the terminus of the railway (see p. 190) passing through Arequipa (35,000) on a fertile plain, to Puno on Lake Titicaca, and Cuzco (15,000), the ancient capital of the Incas. The eastern plains are forested. Iquitos

(3000) is an important river-port on the Amazon a little below the confluence of the Marañon and Ucayali.

Bolivia (about 708,000 square miles, and 2,300,000 inhabitants, of whom 15 per cent are pure white, and 37 per cent pure Indians) includes not merely the plateau and eastern ranges, but the forested and savanna plains to the east, in the Upper Madeira and Pilcomayo basins. It has no coast-line, but lines run to Mollendo in Peru and Antofagasta in Chile. The famous silver-mining centre of Potosi is near the latter line, which runs to Oruro, another declining silver town (see p. 210).

The capital La Paz (80,000) (see p. 195), on Lake Titicaca, is the great market for quinine and coco, obtained from the eastern valleys.

Among the former capitals is Sucre (27,000), on the upper Pilcomayo, and Cochabamba (29,000), on the upper Madeira—both trade centres. Rubber is the chief product of the plains.

Chile (about 300,000 square miles, and 3,000,000 inhabitants, of whom 50,000 are Indians, and 90,000 foreigners) occupies the narrow western slopes and valleys of the Andes south of 18° S., and extends on an average about 100 miles from the Pacific. The northern deserts of Antofagasta and Atacama (see p. 207) have deposits of nitrate of soda, valuable as fertilisers, which are shipped at Iquique (43,000), and Antofagasta (16,000), the terminus of the Bolivian Railway. Coquimbo is the port of La Serena (29,000), the centre of copper mining. South of 30° S. the valley of Chile receives more rain and is fertile (see p. 198). In the centre lies Santiago, the capital (see p. 205) (335,000), a beautiful city, 55 miles from Valparaiso (145,000) as the crow flies, but 115 miles by the railway, which climbs over the coastal range. Valparaiso (see p. 206), the largest port in the west coast of South America, is surrounded by fortified hills in the south, but open to the north. Talca (43,000), and La Concepcion (50,000), and Valdivia (8000) are the other centres of this valley, which produces cereals, olives, grapes, and all kinds of Mediterranean fruits. Coal is found south of La Concepcion. Punta Arenas (3200) is the Chilean port in the extreme south on the Magellan Strait, where gold is mined and sheep are reared.

Argentina (about 1,200,000 square miles, with over 4,000,000 inhabitants, including many Italian, Spanish, French, British, and German emigrants) lies east of the Andes and south of 22°

S. and west of the Uruguay. The colder and drier Patagonian plateau, the western semi-desert regions, and the Gran Chaco of the north have few inhabitants. The province of Buenos Aires, between Bahia Blanca and the Plate estuary, the region between the Uruguay and the Cordoban Mountains, and the irrigated lands at the eastern base of the Andes north of 35° S., are all very fertile, and are gradually being settled. The grass lands are the feeding grounds of innumerable herds of cattle, horses, and sheep—all sources of valuable exports. Few parts of the world have possibilities of greater economic development than the Argentine Republic. Bahia Blanca (7000) is the outlet for the wheat and maize of Southern La Plata, with which it is connected by a growing network of railways. La Plata (45,500), the provincial capital, and Buenos Aires, on the Rio de la Plata, are the northern ports of this region. Buenos Aires (1,000,000 with suburbs), the largest city in the southern hemisphere, is the federal capital, commercial and intellectual centre of the republic, and all the great river and railway traffic converges to it (p. 141). Rosario (135,000) and Santa Fé (33,000), Parana (27,000) and Corrientes (18,000) (see p. 134) are river-ports, to the first of which ocean-vessels penetrate. Cordoba (53,000) lies at the west of the eastern agricultural region. Mendoza (32,000), Tucuman (55,000), and Salta (18,000) are in the irrigated western regions, producing sugarcane, maize, tobacco, vines, and many live stock. All are joined to Buenos Aires by railway. Mendoza (see p. 211), near the Uspallata Pass, is the centre of the trade with Chile.

Uruguay (about 72,000 square miles, and 1,000,000 inhabitants) is surrounded by waterways on three sides—the Uruguay, the Plate, and the ocean (see p. 127). It has a climate favourable for most temperate and sub-tropical crops, but hitherto its vast undulating grass lands have been given up to cattle-raising. Paysandu and Fray Bentos (5000) (see p. 130), on the Uruguay, and Montevideo, on the Plate, are the centres for slaughtering cattle and preserving their flesh. Salto (12,000), on the Uruguay, is a mining centre. The capital, Montevideo (266,000), lies on a fine semi-circular harbour, near the eastern end of the north shore of the Plate (see p. 128).

Paraguay (about 98,000 square miles, and 650,000 inhabitants), the Mesopotamia of South America, lies between the Pilcomayo and Parana, above the confluence of the latter with

the Paraguay, which runs through the heart of the country. Cattle and horses are reared; maize, oranges (see p. 140), and tobacco are grown, and the *yerbe-maté*, or Paraguay tea (see p. 139), and excellent timber trees grow wild. The agricultural possibilities are as great as in the sister republics. The capital is Asuncion (80,000), on the Paraguay, opposite the mouth of the Pilcomayo, to which large river steamers can ascend. A railway joins it to Villa Rica (25,000), in the eastern plains.

The Falkland Islands (6500 square miles, and 2000 inhabitants) lie in latitudes corresponding to Kent and Essex, but have a much colder and rainier climate. Tall grass, low shrubs, and many peat bogs cover the islands, which are crossed by remarkable "rivers of stone," which are gradually moving downwards. Sheep are reared and some horses and cattle. Stanley, on the eastern island, is the capital, a port sought by vessels damaged in the stormy seas off Cape Horn (see p. 160). *South Georgia* is an uninhabited island, politically attached to the Falklands.

Brazil (about 3,300,000 square miles, and 15,000,000 inhabitants). The United States of Brazil is a vast Federal Republic of almost the same size as the United States of America, the Australian Commonwealth, and the Dominion of Canada, and consequently not much smaller than Europe. The greater part of the republic lies between the Tropic of Capricorn and the equator, and consists of the vast forest of the Amazon Lowlands and the savanas and river-woods of the Brazilian Highlands. The east coastal regions are the only ones as yet much developed, and they are peopled by Europeans, negroes, and their descendants, pure and mixed; while the forests are the homes of many little-known Indian tribes (see p. 104).

The provinces completely south of the Tropic have many Italian and German immigrants, and are important for the cattle which feed on the western savanas. In the east, plantations are as yet but little developed. Rio Grande do Sul on the south, and Porto Alegre (80,000), the provincial capital on the north of the Patos lagoon, are the chief towns. Near the Tropic, the coast, valleys, and ranges run from W.S.W. to E.N.E. This is the centre of coffee cultivation (see p. 122), for which the state of São Paulo, with its capital of the same name (330,000), and its port of Santos (35,000), is especially famous. Numerous railway lines connect Ouro Preto (22,000), and other

towns of Minas Geraes (see p. 114) famous for their mines, with Rio de Janeiro, across a region where cattle are bred and plantations are cultivated. Rio Janeiro (800,000), next to Buenos Aires, the largest city in the southern hemisphere, is situated on a perfect and beautiful harbour (see p. 118). It is the federal, political, and commercial capital. Bahia or San Salvador (230,000) and Pernambuco or Recife (120,000) are outlets for the plantations of sugar-cane, cacao, and tobacco on the east. Fortaleza or Ceara (33,000), and San Luiz or Maranhão (29,000), ship cacao, rubber, and other forest products in the north. The chief port for forest produce is Para (see p. 108) or Belem (100,000), on the Para River, below the mouth of the Tocantins. Manaus (40,000), at the mouth of the Negro, is the chief river-port of the Amazon. In the south, the State of Matto Grosso is little known; its capital, Cuyaba (see p. 136), is on a tributary of the Paraguay.

French Guiana or *Cayenne* (about 30,000 square miles, and 30,000 inhabitants), between the Oyapock and the Maroni, is little exploited, but produces gold, cacao, and phosphates, and is a penal station. The capital, Cayenne or St. Louis (12,000), is on a deltaic island of the Cayenne River.

Dutch Guiana or *Surinam* (about 46,000 square miles, and 75,000 inhabitants), between the Maroni and the Corentyne, produces much sugar-cane and some cacao, coffee and cotton, on its irrigated coastal plains, cleared of mangrove swamps, and dyked by the Dutch. Excellent timber is found in its forests. The capital, Paramaribo (35,000), is on the Surinam River.

British Guiana or *Demerara* (about 90,000 square miles, and 300,000 inhabitants), lies between the Corentyne and the Barima. It was formerly Dutch, and resembles Dutch Guiana in its fertile, irrigated, coastal plain, where sugar is the chief crop (see p. 84), but where nearly all kinds of tropical produce flourish (see p. 82). In the south are dense forests, and rich gold-fields difficult to reach and exploit. The capital, Georgetown (53,000), is on the Demerara River (see p. 90). It is the commercial centre, and makes rum and molasses.

NOTE.—In most cases the figures for areas, heights, and especially those for population, are rough approximations. Authorities differ greatly in their estimates.

A DESCRIPTIVE GEOGRAPHY OF CENTRAL AND SOUTH AMERICA

I. THE WEST INDIES

Nassau, New Providence, Bahamas

THE city of Nassau is built on the north shore of the island of New Providence. Its harbour is excellent, being protected by a long *cay*--a name given familiarly to an island in these parts--called Hog Island, which stretches from east to west about half a mile from the shore. The principal entrance to the harbour is at the west end, and is deep enough to admit vessels drawing 17 feet of water. "The waters, clear as crystal, show ever-varying gradations of colour."

About 400 feet from the harbour runs a slope 90 feet high, on which the town of Nassau is built. Flowers are everywhere. Every house stands in its own garden, full of broad-leaved wild almond, acacia, and other flowering trees. All sorts of creepers, laden with pink, purple, blue, and yellow masses; hibiscus, poinsettia, roses, jessamine, stephanotis, gardenia, and bougainvillier grow in great profusion; double oleanders, of which there are three different shades of rose-pink, besides white; the white datura and arbutelon grow to a great height, and coconut palms abound all over the island.

All around the town are the negro settlements, as the coloured people live all together and quite apart from the whites.

L. D. POWLES.---*The Land of the Pink Pearl.* Sampson Low.

By permission of Messrs. Sampson Low.

Cuba

The highest projection of the rocky skeleton is in that eastern head of the island whose southern coast-line runs nearly due east and west from Cape Maisi to Cape Cruz. Here is a well defined mountain range, called the Sierra Maestra, springing abruptly from the water's edge and starting with the sharp headland at Cape Cruz, and rising in a series of terraces to the crest of Ojo del Toro, 3300 feet high. Farther east it culminates in the Pico Turquino (Blue Peak), of a height variously estimated from 6900 to 8100 feet. From this height there is a precipitous decline seaward, and a gradual slope landward in a broad plateau, which declines into the valley of the Rio Cauto on the north. Continuing eastward, the mountain system contracts into the Sierra del Cobre (Copper Mountains), which finally breaks into the circle of hills about Santiago Bay, and then sinks away into the marshy valley of the Rio Guantamano.

Beyond a wide depression that lies eastward from these lofty sierras, there is a mountainous region of disordered masses, cut into groups or isolated peaks by river valleys, and sometimes culminating in those sharp crests known as *cuchillas*, or knives. One of these mountain masses, the Yunque (Anvil) de Baracoa, is a grand truncated cone 3300 feet high. Turning westwards, we find these irregular depressions running parallel to the northern coast, until, near the middle of the island, the whole upland structure falls away into a depression, only 45 miles across from coast to coast, traversed in former times by a *trocha*, or trail, and in recent years by a railroad. This is a central

plain, bordered on both sides by low marshes. West of this depression the land rises again into hills, which are often broken by precipices and ravines into a mountainous aspect, but seldom reach an elevation of 1000 feet. There is a culminating point north-west of Trinidad, near the southern coast, called the Potrerillo, which is said to reach an altitude of 2900 feet. Near the northern coast, between Matanzas and Havana, the Pan de Matanzas is 1300 feet high, and west of Havana there is a range, the Cordillera de los Organos, whose loftiest height is 2000 feet. The terminating headland is north of the Bay of Guadiana, and across that is a low peninsula of swamps and sand-dunes to Cape Antonio.

In the shell of limestone that covers much of the great island are many caverns, some of vast extent, with tortuous labyrinths and dark galleries, corridors and vaults, and with pools and streams into which the surface water disappears.

The rivers of Cuba are mostly insignificant in length and volume, flowing north or south from the interior highlands to the sea.

A. K. FISKE.—*The West Indies*. G. P. Putnam's Sons.

By permission of Messrs. Putnam.

Economic Trees of Cuba

Of the approximately 28,000,000 acres in Cuba and its islands, it is estimated that from 13,000,000 to 15,000,000 acres are covered with timber, the vastly larger portion of it yet untouched by the axe. Of this, mahogany and cedar lead in value as lumber, though, from the variety of its uses, the palm, of which there are thirty species in the island, easily takes precedence. A notable peculiarity of tree growth in Cuba is the presence of the pine, a distinctively northern product, yet here it is found growing side by side with the mahogany.

Of the thirty varieties of palm, the first and foremost is

the palma real, or royal palm, called also "the blessed tree," because of its manifold uses to man. This tree is common all over the island, growing alike on hills and in valleys; but it is most frequent in the west, where the soil is generally richest and heaviest. It rises to a height of from 60 to 80 feet, like a tall shaft of rough grey marble, and from its top springs a great tuft of green leaves. Its peculiar growth does not make it especially valuable as a shade tree, but an avenue of palms is unequalled in its impressive beauty. Of its uses in other respects an inventory can scarcely be made. Its roots are said to have medicinal virtues. The stem of its leaves, or *yagua*, often 6 feet in length, is like a thin board, and can be used as a dinner plate by cutting it into shape; it may be folded like stiff paper when wet; and is bent into a *calana*, or basin, or a pot, in which food may be boiled, and there is sufficient salt in the wood to make the food palatable; it serves also as a basket for carrying farm products; it is said a dozen *calanas* will produce a pound of salt. The seed of the royal palm furnishes an excellent mast for fattening hogs; good weather-boarding is made from its trunk, and the lumber may also be made into plain furniture; its leaves form the roofs of houses; fine canes are made from the hard outside shell, which may be polished like metal; the bud of the tuft is a vegetable food much like cauliflower in taste, and is eaten raw and cooked; and hats, baskets, and even cloth may be made from its leaves and fibre.

Cuban mahogany is the most valuable known in the market. Mahogany-cutting in Cuba is done in the most primitive fashion, and undergoes numerous difficulties, and thus far it has been carried on in only the easily accessible places, leaving millions of feet yet standing in the dense forests of the interior. The United States is most familiar with Cuban cedar in the form of cigar-boxes.

Next to the lumber trees in Cuba are fruit-bearing trees of an almost innumerable variety. The banana, of which millions of bunches are shipped annually, easily

leads its competitors in point of value. It is scarcely necessary to comment on a fruit so well known. A few other Cuban fruits are oranges, lemons, limes, mangoes, rose-apples, pine-apples, pomegranates, *sapotes*, tamarinds, citrons, figs, custard-apples, guavas, and *aguacates*. Cuban oranges are considered by many experts to be the best and sweetest in the world.

The lemon tree, with its white flower and its varicoloured fruit, is one of the prettiest trees to be found in Cuba. Its leaves are almost as fragrant as those of our lemon verberna. The yield is continuous. The rose-apple, or rose-fruit, grows on a tree of remarkable symmetry, with glossy leaves, and is as large as a good-sized peach, smooth-skinned, and cream-coloured; with an odour and taste of attar of roses—so strong, in fact, as not always to be agreeable after the first one is eaten. The mango, of Oriental origin, flourishes everywhere in Cuba, growing on a tree similar to our apple tree. It is the size of a pullet's egg, yellow in colour, grows in long bunches, is very juicy when fully ripe, and is agreeable to most tastes. The *sapotilla* is a fine tree, with a bell-shaped white flower, as fragrant as apple-blossoms; and the fruit is the size of a peach, in a rough russet skin. When ripe it is delicious and melts in the mouth. The custard-apple grows wild, and is also cultivated. It is green in colour, tough-skinned, acid in flavour, and full of small black seeds. It weighs as much as $1\frac{1}{2}$ lbs., and is used for flavouring purposes. The star-apple is so called because, when cut in half, a star appears in the centre. The meat is green in colour when the fruit is ripe. It is eaten out of the skin with a spoon, and has the flavour of strawberries and cream. The guava grows on a tree like a cherry tree, and though not eaten in its natural state, it is of universal use in making the well-known guava preserves and jelly. The guava has a peculiar odour which will scent a room for hours after the fruit is cut. The tamarind grows in a pod-shape on a lofty shade tree, and when ripe is of the consistency of marmalade and quite as luscious. •The *aguacate*, better known as the

alligator pear, is a vegetable fruit, and is used as a salad. Last but not least is that delightful fruit, the pine-apple. The fruit grows out of a bunch of great leaves, 18 inches or 2 feet from the ground. The fruit stem matures in about eighteen months after planting, bears one apple, and will bear an apple after that annually for three or four years.

R. P. PORTER. - *Industrial Cuba*. 1899. G. P. Putnam's Sons.

By permission of Messrs. Putnam.

Havana, Cuba

The coast-line of Cuba from Cape Tiburon has none of the grand aspect of Jamaica. Instead of mountains and forests, you see undulating hills, cultivated with tolerable care and sprinkled with farm-houses. All the more imposing, therefore, are the walls and towers of the great Morro, the fortress which defends the entrance of the harbour. Ten miles off it was already a striking object. As we ran nearer it rose above us, stern, proud, and defiant, upon a rock right above the water, with high frowning bastions and the lighthouse at an angle of it.

The harbour is something like Port Royal,¹ a deep lagoon with a narrow entrance and a long natural break-water between the lagoon and the ocean; but what at Port Royal is a sand-spit 8 miles long is at Havana a rocky peninsula on which the city is built. The opening from the sea is half a mile wide. The Morro rises opposite at the extreme point of the entrance, and next to it, farther in towards the harbour on the same side, on the crest and slopes of a range of hills, stands the old Morro, the original castle which beat off Drake and Oliver's sea-generals.

The city, as we steamed by, looked singularly beautiful, with its domes and steeples and marble palaces, and glimpses of long boulevards and trees and handsome mansions and cool arcades. Inside we found ourselves in

¹ For Port Royal see Kingston and Port Royal, p. 12.

a basin, perhaps of 3 miles diameter, full of shipping of all sorts and nationalities. A hundred boats were plying to and fro, with their white sails and awnings. Flags of all countries were blowing out at stern and masthead.

I found myself in Old Castile once more. Church beyond church, palace beyond palace, the narrow streets where neighbours on either side might shake hands out of the upper storeys, deep colonnades, private houses with windows grated towards the street, with glimpses through the street door into the court and garden within, with its cloisters, its palm trees, and its fountains; the massiveness of the stonework, the curious old-fashioned bookstalls, the dirt, the smell,—it was Toledo or Valladolid again.

My first object was the cathedral and the tomb of Columbus. The cathedral was a vast building, little ornamented, in the style of the time of Philip II. At the right of the altar was the monument I had come in search of—a marble tablet, and on it a poorly-executed figure in high relief, with a ruff about its neck, and features which might be intended for any one. Somewhere near me were lying the mortal remains of the discoverer of the New World.

J. A. FROUDE. - *English in the West Indies*. Longmans.

By permission of Messrs. Longmans.

For a detailed description see *ibid.* p. 296.

Santiago de Cuba

Santiago, as it is called by the Americans,—Saint Jago or simply Cuba by the natives,—is a port second only to Havana in strategic and political importance. It is the capital of the eastern department as well as its most flourishing seaport. It is located on one of the many pouch-shaped harbours which outlet to the sea through a narrow gateway like that of Havana. At its narrowest part this outlet is only 180 yards wide, but it gives access to a magnificent basin, with many indentations,

large enough to accommodate all the shipping of the island. Its many-coloured structures, promenades, gardens, and superb prospects over the valley, make Santiago one of the most marvellous cities in the Antilles. The town is well fortified. Back of the city the overtowering cliffs of the Sierra Maestra separate it from the interior. Several lines of railroad run from the city to the iron mines 16 miles east, where Pennsylvania capitalists were employing 2000 hands at the date of the recent outbreak. The city is the telegraphic centre from whence radiate the submarine coastal cables of the island for the western department, Mexico, Jamaica, South America, Haiti, Porto Rico, and the Lesser Antilles.

R. T. HILL.---*National Geographic Magazine*, 1898.

By permission of the National Geographic Society.

Jamaica

On the south-eastern side as you approach the island, the Blue Mountains rise up in all their magnificence before you. Softened by distance into a deep azure hue, they are distinguished from the lower ranges of hills which advance gradually to meet them from the verge of the shore on which the city of Kingston stands. These are clothed in luxuriant verdure, and fantastically girdled with clouds.

A lofty mountain range traverses the island, rising towards the northern coast to the height of 7000 or 8000 feet. Where these mountains are abrupt and broken into precipices gigantic trees are to be seen, which appear to take root in the rock itself and spread out their branches over the abyss below. In other places a noisy stream forces its way to the sea, breaking into foam over every impediment.

The scenery amidst the recesses and pinnacles of the mountains assumes in some parts a character of Alpine grandeur. Where the mountains wear a milder aspect

they seem by common consent to have withdrawn themselves to make room for spacious valleys, which are watered by gentle rivulets and interspersed with fragrant groves of the orange and pimento tree. On the margin of the stream fragrant and beautiful wild-flowers flourish, such as we preserve in our greenhouses. On the gradual descent to the lowlands are extensive fields of sugar-cane, that elegant reed of the light and purple flower and arrowy leaf. The milder range of hills is broken into ravines all covered with foliage, and low white houses are scattered along the coast.

Look at Jamaica from whatever point of view you may, the grandeur of the scenery forces itself on your notice. View it from the ocean, and how magnificent is its aspect. There are the lofty Blue Mountains, with their summits veiled in clouds. And such forests, impenetrable in many parts from their wild and matted underwood! Or look at it from its own heights, and what a splendid scene presents itself. Mountains immediately around, forming a bold and intrepid foreground; the far-spreading and beautifully diversified landscape beyond, stretching out to the distant sea, which like a sheet of silver extends to the far horizon.

MRS. LYNCH. - *Wonders of the West Indies*. Seeley, Jackson, and Halliday. 1856.

Climate and Products of Jamaica

The varied surface of Jamaica, with altitudes ranging from the levels along the sea, up through the plateaus of the western end of the island, to the 7360 feet of the Blue Mountain peaks, affords a great range of climate.

May and October are the two great rainy seasons, in which months, at the new or full moon, it begins to rain, and continues day and night for a whole fortnight with great violence, so that the earth in all level places is under water for some inches.

Jamaica is essentially an agricultural country. The

coffee and fruit industries have increased very rapidly during the last fifteen years. Coffee-growing is the best of all these industries, not only because coffee is non-perishable and therefore easily transported, but because there is every indication that the high prices which now rule will continue for many years. Moreover, on the high lands, which are best suited to coffee, the climate is cool and pleasant.

The natural requirements of the banana plant are totally different from the coffee tree; for while the latter flourishes in the cool mountain country, the former requires a hot climate, and will only grow in perfection on the rich plain land. It is true that the small patches of the negroes are often seen on steep hill-sides and far in the interior, but the fruit is generally small and inferior. The large plantations of the white men are always on the flat lands.

There are many fine coco-nut groves on the island, but, owing to the long time necessary for the first crop, not so much has been done as in other industries. The trees seldom bear until seven years old, but once in bearing they continue for a hundred years, and are a veritable mine of wealth. On the same tree blossoms, green fruit and ripe fruit can always be seen. Coco-nut trees like sea air, and do not do well if planted too far from the coast. After the first few years they need no cultivation, and the land on which they grow can be put into grass and pasturage.

Oranges grow in perfection on the higher lands. Lemons, limes, grape fruit, shaddocks, and all kinds of citrus fruits, grow well. Most excellent vegetables can be grown and be ready for market between December and March. Jamaica is thus capable of being made the market-garden of the United States during a season in which it would have a monopoly.

The keeping of live stock plays an important part in the agriculture of Jamaica. The stock-farms usually combine from 500 to 1000 acres of grass land with perhaps

as much more of woodland or ruinate—abandoned land covered with bushes and small trees. The grass land comprises pimento grass on the highlands and Bahama grass on the lowlands at the coast. Guinea grass, which flourishes in either locality, grows so abundantly that a field of it will keep double the number of cattle that the field would in any other kind of grass. All kinds of stock except sheep are very fond of it.

J. H. STARK.—*Guide to Jamaica*. Sampson Low.
By permission of Messrs. Sampson Low.

Tropical Vegetation of Jamaica

One of the most remarkable characteristics of Jamaica is the copiousness of its rivers. The original name, Xaymaca, signifies a country of streams. By far the greater portion of the island is covered with wild wood and jungle. Through this one sees the gardens or provision-grounds of the negroes. They contain cacao trees, bread-fruit trees, oranges, mangoes, limes, plantains, avocado pears, and a score of others, all of which are luxuriant trees, some of considerable size and all of great beauty. The bread-fruit tree and the mango are especially lovely, and I know nothing prettier than a grove of oranges in Jamaica. In addition they always have the yam, which is with the negro somewhat as the potato is with the Irishman. As with the potato, the root alone is eaten, but the upper part is fostered and cared for as a creeper, so that the ground may be unencumbered by its thick tendrils. Patches of coffee and arrowroot, and occasionally also patches of sugar-cane, are to be seen in these provision-grounds. Perhaps the most graceful tree is the bamboo. It grows in clusters or in long rows by the river-sides. Their great height, the peculiarly graceful curve of their growth, and the excessive thickness of the drooping foliage of hundreds of them clustered together produce an effect which nothing can surpass.

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The cotton tree is almost as beautiful when standing alone. The trunk of this tree grows to a magnificent height and with magnificent proportions. Nature, in order to sustain so large a mass, supplies it with huge spurs at the foot, which act as buttresses for its support, connecting the roots immediately with the trunk as much as 20 feet above the ground. I measured more than one, which, including the buttresses, was over 30 feet in diameter. From its head the branches break forth in most luxurious profusion, covering an enormous extent of ground with their shade. The most striking peculiarity of those trees consists in the parasitic plants by which they are enveloped. These are of various kinds, the fig being most obdurate. The original tree has frequently departed wholly from sight, and I imagine almost wholly from existence. But it often happens that the tree has reached its full growth before the parasites have fallen on it, and then, in place of being strangled, it is adorned. Every branch is covered with a wondrous growth—with plants of a thousand colours. Some droop with long and graceful tendrils from the boughs and touch the ground, while others hang in a ball of leaves and flowers.

ANTHONY TROLLOPE.—*The West Indies and the Spanish Main.*
Chapman and Hall.

Kingston and Port Royal

The dawn was breaking when I came on deck. The Blue Mountains were hanging over us on our right hand, the peaks buried in mist. As so often in the Antilles, a level plain stretched between the sea and the base of the hills, formed by the debris washed down by the rivers in the rainy season. Among cane-fields and coco-nut groves we saw houses and the chimneys of the sugar factories. Presently Kingston itself came in sight, and Up Park Camp, and the white barracks high up on the mountain side. Between us and the town was the long sand-spit which encloses the lagoon, at the head of which it is built.



PORT ROYAL, JAMAICA.

Volcanism & Seism., 1914.

It is 8 miles long, rising but a few feet above the water-line, nowhere, except at the extremity, more than 60 or 100 yards across. The thundering swell of the Caribbean



KINGSTON HARBOUR.

Sea breaks upon it from year's end to year's end. Where the sand is dry, beyond the reach of the waves, it is thickly planted with palms, and appears from the sea a soft green line, over which appear the masts and spars of

the vessels at anchor in the harbour and the higher houses of Kingston itself. To reach the opening into the lagoon you have to run on to the end of the sandbank, where there is a peninsula on which is built the Port Royal so famous in West Indian story. Halfway down the palms the lighthouse stands. Treacherous coral reefs rise out of the deep water for several miles. There are but two channels through which the lagoon can be approached.

As we rounded the point the lagoon opened out. Kingston lay 6 miles off at the head of it, now inside the sand ridge, blue and hazy in the distance. At the back were the mountains. Immediately in front were the dockyards, forts, and towers of Port Royal, with the guardship, gunboats, and tenders, with street and terrace, roof and turret and glittering vane, all clearly and sharply defined in the exquisite transparency of the air. The associations of the place no doubt added to the impression. Before the first hut was run up in Kingston, Port Royal was the rendezvous of all English ships which, for spoil or commerce, frequented the West Indian seas. Here buccaneers sold their plunder and squandered their gains. Here Nelson had been, and Collingwood and Jervis, and all our other naval heroes. Here prizes were brought in and pirates tried and hanged. In this spot, more than in any other beyond Great Britain herself, the energy of the Empire once was throbbing.

J. A. FROUDE. *English in the West Indies*. Longmans.

By permission of Messrs. Longmans.

For a detailed description see *ibid.* p. 195.

Hispaniola

What perhaps strikes one most forcibly on first looking at Haiti is the irregular though beautiful appearance of its mountains. They are not, as in most of the other islands, a simple chain running from east to west. A bold line stretches out to the left, softening into gentle hills at the extremity of the long promontory of Tiburon.

In the centre of the island there is, as it were, a gathering together of the loftiest mountains, some of which are more than 6000 feet in height, and this mighty cluster is called the Cibao.

There are frequent ranges running easterly, and you may track these mountains in their fantastic and irregular course far down to the south; and all are clothed in verdure, with evergreen forests ascending almost to their summits.

The shores are exceedingly picturesque. Sometimes a promontory juts out into the sea, and then the coast withdraws, forming creeks of singular beauty. Between the peninsula of Tiburon and the north-west promontory of the island is the beautiful and spacious bay of Gonave, on whose bosom rests the island of the same name, and in the luxuriance of its tropical foliage seems like an emerald set in its pearly waters. Far out on the seas around are small uninhabited islands and dangerous reefs; but, notwithstanding the difficult approach, the island has in many parts excellent harbours.

The mountains nowhere extend to the shore, along which vast savannas stretch for miles. In the south-east are the plains of Los Llanos, which have a breadth of 20 to 25 miles. These have generally been used as pasture-lands. Near to these, and extending inland between two lofty mountains, is the gigantic valley of Vega Real; and this at one time, being carefully cultivated, was the garden of all the products of the island. In the west are the extensive savannas of Artibonito and of Cul-de-Sac. Numerous rivers, with gold still lingering in their beds, intersperse these plains, their abundant waters being supplied by mountain torrents which have made for themselves a silver pathway from the high lands. Sometimes leaping over rock barriers, they break into beautiful and misty spray. Indeed, Haiti's mountain scenery would, after all, be imperfect without these cataracts.

Across Haiti

I landed at Jacmel on the southern coast of Haïti, on 16th November. Jacmel lies in a fold of green cliff on the edge of a beach, where the plunging surf breaks almost at the foot of the palms. It looks picturesque enough from the sea, its white houses set amongst vivid green; but when I landed on the rotten black wharf and made closer acquaintance with its realities, I found other terms more applicable to it. The streets are incredibly dirty, for the Haïtian never dreams of either cleaning or mending them, and sanitary matters appear to be outside the range of his intelligence. Refuse of all kinds is simply thrown into the roadway and left for the sun to deal with.

But the place teemed with life; a noisy, vociferous crowd of negroes of all sizes and ages jostled each other through the dust and glare. Processions of under-sized donkeys, laden with guinea-grass, passed up and down amongst them. All was life and bustle of the idle sort.

If you take a map you will judge the distance between Jacmel and Port au Prince to be about 25 miles, but when I tell you that there are between 120 and 150 fords to be crossed (the number varying with the seasons), and that the road turns back upon itself and follows the bends of the rivers, you will understand that the local estimate of the distance as being 68 miles is by no means excessive.

There is no such thing as a road; a narrow track overhung by trees and creepers takes you down to the first ford. Thereafter, you follow the river bed as often as not. Luckily, the Haïtian horses—small, long-tailed little beasts—are sure-footed, for we were still travelling when night came on, and the track had, if anything, grown worse.

We passed but a few huts, and the province seemed to be comparatively thinly populated. At last we reached a hut which was to be our resting-place for the night. It was situated with two or three smaller hovels inside a

stockade. Windowless and earth-floored, it had very little more of convenience or comfort about it than the home of a savage. But the owner was the incarnation of the spirit of hospitality.

Before dawn we recommenced our journey by climbing the lower spurs of the mountain range which forms the backbone of the Tiburon peninsula, and before daylight reached the top of the pass, from which we could see the Bay of Port au Prince on the north and the Caribbean Sea to the south.

The heat increased as we went down the northern slopes, but soon there were increasing signs of denser human habitation—huts shaded by mangoes and tamarinds, and shut in by bananas, near which naked children played and their elders lounged in the shade. After a hot ride across the plain, we at last arrived at Port au Prince.

The Black Man's capital, as far as cleanliness goes, is much as his other towns. The same gutters flowing along the streets, the same garbage and refuse strewn over every inch of road surface. The street itself, being absolutely out of repair, is a network of holes, inequalities, and pools. The heavy tropical rains flush them at intervals, but their condition meanwhile is indescribable. The chief boulevards are overhung with trees. A steam tram passes up and down to the harbour every half-hour or so. Military police occupy miserable guard-rooms here and there along the boulevards, and cook their food beside the sluggish drains which meander under the low piazzas, where the men play dice when they are not sleeping in their hammocks slung from the roadside trees. At the head of this thoroughfare stands the cathedral and the palace of the president, but neither of these buildings has any architectural pretensions. Altogether the city is unkempt and unclean.

H. PRICHARD.—*Geographical Journal*, September 1900.

By permission of the writer and of the Royal Geographical Society.

Porto Rico

Porto Rico is the most eastern and smallest of the Great Antilles, being 500 square miles less in area than Jamaica. It is 95 miles long, 35 miles wide, and has an area of 3368 square miles. The coast line is about 360 miles in length. Its area is 300 square miles greater than that of Delaware, Rhode Island, and the district of Columbia combined, and 300 square miles less than that of Connecticut. At the same time, it is the most productive in proportion to area, the most densely settled, and the most established in its customs and institutions. It is also notable among the West Indian group, for the reason that its preponderant population is of the white race, and that it produces food-stuffs almost sufficient to supply its inhabitants as well as some of the neighbouring islands.

Although it nowhere attains the great altitudes of the other Antilles, the island is practically the eastward continuation of the Antillean chain of uplifts. It rises from the shallow submerged bank which borders it for a few miles, and is a continuation of the other Antilles. This bank is the upward extension of a remarkable submerged mountain slope, which, at least on the north side, descends nearly 30,000 feet to the bottom of the Brownson Deep, until recently supposed to be the deepest hole in the world. Its outline presents the appearance of an almost geometrically regular parallelogram, nearly three times as long as broad, with its four sides following the four cardinal directions. The sea-line, unlike that of Cuba, is almost straight, and the coast is usually low, especially on the southern side, although there are a few headlands. It is also void of fringing keys and deep indentations of its coast, such as border the island of Cuba.

R. T. HILL.—*National Geographic Magazine*, 1899.

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Fertility of Porto Rico

Once on shore the traveller realises for the first time what a wealth of loveliness and fertile possibilities lies in this land, clothed with a livery of tropical vegetation. Almost every foot of ground is steep and rolling except along the coast-lines and in a few narrow valleys of the interior, where the earth lies seemingly as flat as a floor, from the banks of the wandering rivers to the very foot of the mountains, which rise abruptly to sharp curved crests, a thousand feet above. Table-lands there are none: the mountain uplifts are flexed into razor-backed ridges, and time and weather have fought against the form-preserving vegetation with sufficient success to mould their sides into soft erosional shapes, steep-sided and high, but covered to their very tops with rich, fertile, and cultivable soil. While there are no flat-topped mountain ranges in the interior, the few narrow valleys, found mainly on the northern side east of the centre, are elevated above the sea as much as 1000 feet, and no more delightful place of abode for white men can be imagined: perfect landscapes, a soil under which almost everything under heaven will grow, cool nights, bearable days, and the whole set off with a filigree-work of heavy clouds, wonderful rainbows, overhanging stately palms, waving, broad-leaved banana plantations, food- and fruit-trees, and jungle forests. It is a tropic elysium, and will become the winter Mecca of America.

W. DINWIDDIE. *Puerto Rico*. Copyright. 1899. Harper and Brothers.

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Antigua

Antigua is so generally spoken of as a dry-as-dust place, where the earth refuses to yield water for the use of man, that I received more than ordinary pleasure in gazing on the gentle wooded hills and green vales which

decorate the interior of the island. Antigua on a larger scale is formed like Anguilla—that is, without any central eminences, but for the most part ramparted around by very magnificent cliffs, which slope inwards in gradual declivities. From some of these rocks, especially near the parsonage of St. Philip's Parish, one of the finest panoramic views in the world may be obtained. The whole island, which is of a rough circular figure, lies in sight. The heart of the island is verdant with an abundant pasturage or grassy down, and the numerous houses of the planters, embosomed in trees, have more of the appearance of country mansions in England than almost any others in the West Indies.

The shores are indented in every direction with creeks and bays and coves, some of them running into the centre of the plantations like canals, some swelling into estuaries, and others forming spacious harbours. Beyond these an infinite variety of islands and islets stud the bosom of the sea, and stand like so many advanced posts of defence against the invading waves. They are of all shapes and sizes, and are given up to the rearing of provisions and the maintenance of a great number of cattle. From the same hill, when the western sky is clear, Guadaloupe, Montserrat, Nevis, and St. Kitt's may all be distinguished with the naked eye.

The tortuous descent of Figtree Hill, though not so rich and imposing as the mountains and valleys of Trinidad, is yet a patch of scenery so exquisitely beautiful that no painter or poet who has once seen it can ever forget the sight. A prodigious number of forest trees grow on the tops and declivities of the cliffs, and luxuriant festoons and knots and nets of evergreen creepers connect them all together in one great tracery of leaves and branches. The wild pine sparkled on the large limbs of the wayside trees; the dagger-like Spanish needle, the quilled pimploe, and the maypole aloe, shooting upwards to 20 feet with its yellow flowering crown on high, formed an impenetrable mass of vegetation around the

road, and seemed fixed on purpose there to defend the matchless purple wreaths of lilac jessamine, which softened the dark foliage amongst which they hung.

H. COLERIDGE.—*Six Months in the West Indies in 1825.* Murray.

Scenery of Montserrat

If you ever visit Montserrat, good reader, go, even if you have only one day, to the Souffrière. I have seen a thousand beautiful things in the West Indies, but I cannot even now think of my morning ramble to this Souffrière without feeling my heart swell with love and sorrow that I shall never see it again.

At first the road lay along the margin of the sea, then wound inwards by a gentle acclivity towards the mountains. The snowy amaryllis drooped her long and delicate petals; the thrice glorious hibiscus was unveiling his crown and feathers of scarlet; and the light limes and darker orange trees, which formed a verdant hedge on either side, were exhaling their perfumed incense. After this I nearly broke my neck in a dry gully, which ended in one of those green savannas which nature has oftentimes so mysteriously cleared in the midst of the impenetrable virgin woods of tropical regions. The view was beautiful. Behind me the woody mountain rose into the clouds, before me it descended in a long grassy slope to the edge of the sea. On my right hand, to the south, the broad and irregular eminences of Guadaloupe presented the appearance of a continent. To the north Redonda shone like an emerald in the midst of the blue waves, and beyond it was the great pyramid of Nevis, cut off from sight at one-third of its summit by an ever-resting canopy of clouds.

We tied our horses to a tree and began to descend a circuitous and overarched path to the vale of the Souffrière. This is a wild and romantic scene. The whole of the bottom of the valley is broken into vast and irregular masses of clay and limestone, which are scattered about in

the utmost confusion. The surface of the ground is hot everywhere, and so much so near the streams of water which ran between the fragments that I could not keep my foot half a minute upon it. In the midst of all this there is a green and luxuriant vegetation of bushes and creepers. Some of the flowers were marvellously beautiful. The mountains which rampart round this solitary glen are of skyey height; they appear indeed higher than they really are, for their lancet peaks are never seen except dimly through vast and moving masses of cloud.

H. COLERIDGE. *Six Months in the West Indies in 1825.* Murray 1826.

Guadaloupe

The steamer ran due south, across the vast basin which is ringed round by Antigua, Montserrat, and Guadaloupe, with St. Kitts and Nevis showing like tall grey ghosts to the north-west. Higher and higher ahead rose the great mountain mass of Guadaloupe, its head in its own canopy of cloud. The island falls into the sea sharply to leeward, but it stretches out to windward in a long line of flat land, edged with low cliff and studded with large farms and engine-houses.

Guadaloupe consists, properly speaking, of two islands, divided by a swamp and a narrow salt-water river. The eastward half, or Grande Terre, which is composed of marine strata, is hardly seen in the island voyage, and then only at a distance, first behind the westward Basse Terre, and then behind other islands, the Saintes and Marie Galante. The westward island, rising in one lofty volcanic mass, which hides the eastern island from view, is perhaps, for mere grandeur, the grandest in the archipelago. The mountains range upward higher and higher towards the southern end, with corries and glens, which must be, when seen near, hanging gardens of stupendous size. Tiny knots on distant cliff-tops, when looked at through the glass, are found to be single trees of enormous height and breadth. Gullies, hundreds

of feet in depth, rushing downwards towards the sea, represent the rush of the torrents which have helped, through thousands of rainy seasons, to scoop them out and down. And all the grandeur and richness culminates, towards the southern end, in one great crater-peak, 5000 feet in height, at the foot of which lies the fort of Basse Terre, or Bonrg St. François.

We never were so fortunate as to see the Soufrière entirely free from cloud. The lower, wider, and more ancient crater was generally clear, but out of the midst of it rose a second buried in darkness and mist. Once only we caught sight of part of its lip, not smooth like that of Vesuvius, but broken into awful peaks and chasms hundreds of feet in height. As the sun rose, earth-clouds rolled up from the valleys, wreathed and weltered about the great black teeth of the crater, and then sinking among them and below them, shrouded the whole cone in purple darkness for the day ; while in the foreground blazed in the sunshine broad slopes of cane-field ; and below them again the town, with handsome houses and old-fashioned churches and convents, dating possibly from the seventeenth century, ombowered in mangoes, tamarinds, and palmistes.

In strange contrast with the ragged outline is the richness of the verdure. Steep slopes are grey with groo-groo palms. Each glen has buried its streamlet a hundred feet deep in vegetation, above which, here and there, the grey stem and dark crown of some palmiste towers up like the mast of some great admiral. Eye and fancy strain vainly into the green abyss, and wander up and down over the wealth of depths and heights, compared with which European parks and woodlands are but pultry scrub and shaugh. The islands, though intensely green, are not of one, but of every conceivable green, or rather of hues ranging from pale yellow through all greens into cobalt blue ; and as the wind stirs the leaves and sweeps the lights and shadows over hill and glen, all is ever-changing, iridescent, like a peacock's neck ; till the whole island from peak to shore seems some glorious jewel—an

emerald with tints of sapphire and topaz, hanging between blue sea and white surf below, and blue sky and white cloud above.

If the reader fancies I exaggerate, let him sail down the leeward side of Guadaloupe, down the leeward side of what island he will, and judge for himself how poor, and yet how tawdry, my words are, compared with the magnificent colouring of the Antilles.

REV. CHARLES KINGSLEY.---*At Last.* Macmillan.

By permission of Messrs. Macmillan.

Scenery of Dominica

The scenery behind the town of Roseau is beautifully grand ; indeed the whole prospect from the edge of Morne Bruce, a lofty table rock occupied by the garrison, is one of the very finest in the West Indies. The valley runs up for many miles in a gently inclined plane between mountains of irregular heights and shapes, most of which are clothed up to their cloudy canopies with rich parterres of green coffee, which perfumes the whole atmosphere, even to some distance over the sea ; the river rolls a deep and roaring stream down the middle of the vale, and is joined at the outlet of each side by a mountain torrent, whilst at the top, where the rocks converge into an acute angle, a cascade falls from the apex in a long sheet of silver foam. Beneath, the town presents a very different appearance to what it does at sea ; the streets are long and spacious, regularly paved, and intersect each other at right angles ; there is one large square of promenade ground ; and the shingled roofs of the houses, tinged with the blue of the heaven above them, seem like the newest slates, and put me much in mind of that clear and distant look which the good towns of France have when viewed from an eminence.

I started on horseback with my friend to visit his estate. The ride was most delightful. We went up the valley, forded the Roseau River twice, and pursued an irregular path cut in the side of the mountains. I was

particularly struck with the size of the ferns. There were whole forests of them in the depths and recesses of the hills, and I think most of the separate trees stood 20 or 25 feet in height. Yet with these extraordinary dimensions the branches were as finely pennated and as daintily angled as any I have seen in England, and their colour fresh and vivid beyond description. This is especially owing to the abundance of water which all the year round is running down the declivities and diffusing a coolness of temperature which almost chilled me. I suppose Dominica is the best watered of the Caribbee Islands. The wild plantain also was very conspicuous, with its immense leaves rent into slips, its thick bunches of fruit, and the scarlet receptacle of the seed hanging quaintly down the stem of the tree by a twisted rope. After a long ride we came to my host's coffee works and rested ourselves a space. The situation was on a square terrace jutting out from the breast of the mountain, which rose to a great height above it. Palm trees stood around, coffee bushes flourished upon the declivities, and cascades of water burst through the close vegetation. Below lay the valley, the silver waterfall gleamed through an avenue in the hills, and magnificent piles of rock, sometimes black and bare, sometimes green with countless traceries of creepers, formed the scene right opposite.

II. COLERIDGE.—*Six Months in the West Indies in 1825.* Murray.

Martinique

A dim outline of volcanic mountain far away on the horizon was already visible, and as we plunged along the peaks began to detach themselves and to stand out magnificently against the deep blue sky. Long stretches of green sloped down to the sea-line from lonely peaks and crags of all kinds of fantastic shapes. The wealth of vegetation is perhaps not so great as in St. Lucia or St. Vincent, but nowhere are the outlines of the mountains grander. Nor have I seen any town which looks more

picturesque from the sea than St. Pierre. Two magnificent mountains rise on each side of it, sweeping down in long stretches of what looks like moorland, but is really covered with tropical growth. The red roofs of the houses, rising in tiers from the sea, add colour, which is often wanted in West Indian towns. The streets are brighter and more European-looking than in most of the English islands. Most of the people are coloured, with an evident vein of French blood.

One of the three days at our disposal we spent on a visit to Morne Rouge. For some distance we followed the course of the river in a deep rocky gorge, the water almost hidden by ferns and shrubs. Then we climbed for some miles over green shoulders of mountains, while every now and then a magnificent picture opened out before us, with the blue sea sparkling in the brilliant sunlight, and the bright green of the sugar-cane fields and the houses of St. Pierre fringing the shore. Morne Rouge stands on a kind of table-land in a very exposed situation, and suffered terribly in the hurricane of 1891, almost every house being unroofed. The mountains are not softened by any covering of forest, but rise bleak and bare on every side. We climbed up and up till we reached a quaint Calvary standing on the brow of a hill and overlooking a truly superb panorama of mountain and sea.

E. A. HASTINGS JAY.—*Glimpse of the Tropics*. Sampson Low.
By permission of Messrs. Sampson Low.

St. Lucia

Among all these beautiful islands, St. Lucia is, I think, the most beautiful; not indeed on account of the size or form of its central mass, which is surpassed by that of several others, but on account of those two extraordinary mountains at its south-western end, which, while all conical hills in the French islands are called pitons, bear the name of The Pitons par excellence. As the steamer runs southward along the shore, these two peaks open out, and you

find yourself in deep water close to the base of two obelisks, rather than mountains, which rise sheer out of the sea, one to the height of 2710 feet and the other to that of 2680 feet, about a mile from each other. Between them is the loveliest little bay, and behind them green wooded slopes rise to the rearward mountain of the Souffrière. The whole glitters clear and keen in blazing sunshine; but behind black depths of cloud and grey sheets of rain shroud all the central highlands in mystery and sadness. Beyond them, without a shore, spreads open sea. The fantastic grandeur of the place cannot be described.

REV. CHARLES KINGSLEY. — *At Last*. Macmillan.
By permission of Messrs. Macmillan.

Barbadoes

Barbadoes is very varied in scenery, including table-land and rocky elevations. Mount Hillaby, the highest point, is 1104 feet above the level of the sea.

For a large part of the year the sea breezes keep the air cool and pleasant. There is no miasma, owing to the extent of the cultivation and the porous character of the soil.

The population of Barbadoes is, at the present moment (1889), estimated at about 1050 to the square mile, a very large average for a place no bigger than the Isle of Wight. The principal production is sugar. New machinery is being introduced, and better cultivation, so that from much the same area a larger quantity of sugar is obtained.

C. H. EVES. — *West Indies*. Sampson Low.
By permission of Messrs. Sampson Low.

Tobago

The northern part of Tobago is clothed with unbroken forest, which round the large Man-of-War Bay descends to the coast. Partly owing to the elevation, which ranges on an average from 1300 to 1900 feet, and partly in consequence of the thick forest, the rainfall is very con-

siderable, and favours the growth of a luxuriant vegetation, comprising many forms that require an atmosphere constantly moist. The flanks of the hills are very steep, and the valleys narrow and gloomy, often contracting into rocky gorges, in which the small streams precipitate themselves over perpendicular walls, so that the traveller has to scale the rough slopes and make a long detour. Here, as in typical tropical forests, is found a varied combination of the most diverse kind of trees, bushes, lianas, and epiphytic plants, all mingled together, instead of growing, as in colder climes, in clumps or groups of a single variety. Here are seen large and small trunks laced together by interminable tendrils of liana, small underwood, herbaceous plants and stalks, either clothing the banks of the streams or adhering, as epiphytes, to the trunks and branches of the trees, and a dense confusion of foliage of every description, from the small laurel shape to the huge feathery fronds of palms, the whole producing a gloom seldom relieved by large blossoms.

The vegetation of the island falls naturally into three divisions—the plants of the flat south-western extremity, the crops of the cultivated central part, and the flora of the northern forest region, all which, though of the same general character, present important differences. On the coast the vegetation is similar to that of other West Indian Islands, and varies with the formation of the shore—sand, rock or swamp. The south-western flat land, now that the former partial attempts at the cultivation of sugar and cotton have been abandoned, is clothed with dry brushwood, intermingled with a few scattered trees.

Its constituent forms betray the deficiency of the rainfall in this region. The most common plants have hard, stiff, and finely-divided leaves, and belong to such species as in one way or other are able to endure drought,—as, for instance, acacias, campêche wood, mimosas, cordias. Plants frequently found on similar lands in the West Indies, such as croton and cactus, are absent here—a proof that the climate is not so dry, and that the soil is of a

better quality, for the croton and cactus, in particular, spring up on the driest and poorest land. On some spots agaves grow, and yield material for the fibre manufacture. Otherwise little advantage is derived from this corner of the island. On the sandy coast a few plantations of coco-palms have been laid out, and in the bush a few cattle graze on scanty pastures, consisting of a thin stiff grass, and the leaves of various bushes and dwarf trees. In time, no doubt, the land will be turned to account, being peculiarly adapted for the cultivation of the above-mentioned fibrous plants.

The cultivated districts, which embrace the middle and eastern parts of the island, are covered with plantations of sugar-cane, meadowland, and fields of maize, yams, and pigeon peas, as well as the usual vegetables of the tropics. The ground is very hilly, and little of it is adapted for agriculture on a large scale, though the soil is of good quality, and, assisted by an abundant rainfall, produces large crops.

Sugar plantations are now confined chiefly to the small level tracts along the lower courses of the streams and in the lower parts of the valleys, while the hilly country has been allowed to transform itself into the pasture ground. It is covered with various grasses of poor quality, and is overgrown with bushes, which in all damp tropical lands continually threaten destruction to the herbaceous vegetation, and have to be repeatedly cut down and burned.

Besides these true South American plants grow a large number of varieties which spread more or less northwards, and constitute the connecting links with the West Indian flora.

In the cultivated district are situated the towns of the island—Scarborough, with 1300 inhabitants, and the still smaller Plymouth on the northern side.

ANON.—*Scottish Geographical Magazine*, May 1893.

By permission of the Royal Scottish Geographical Society.

Much of this description applies to most of the West Indies.

Trinidad

The northern littoral range traverses the entire length of the island, and possesses an average breadth of nearly 7 miles, occupying an area (including small islands) of 358 square miles. There are generally two ranges, the subordinate one rising immediately from the sea, and attaining an average elevation of 800 feet, and the main ridge, locally termed Cordillera, which varies from 1600 to 2200 feet. There are several high peaks rising out of this ridge. The culminating summit in the western section is the three-peaked mountain of Tucutche, rising to 3012 feet, and in the eastern section the cerro of Aripo, attaining 2740. Towards either extremity the ridges fuse together, and form on the east a gradual incline to the sea; on the west descending towards the lower hills of the islands of the Bocas, where the chain is interrupted, to rise again and attain a greater elevation on the adjacent mainland.

The valleys are entirely transverse, and of some breadth in the west, becoming merely deep ravines for the passage of the waters to the eastward. They are often contracted near their mouths, expanding in the upper parts into somewhat basin-shaped cavities. The small islands dotting the gulf are detached portions of this hilly system. The declivities are invariably steep, rising almost precipitously from the sea on the north, and descending at high angles to the low land on the south.

The whole district is richly clothed with tropical vegetation, frequently characterised by magnificent timber. The purity of the water, the coolness of the nights, and the beauty of the scenery, combine to render this the most agreeable portion of the island.

The central range extends from Point à Pierre on the west to near the southern bank of the l'Ebranche on the east, a length of about 35 miles. When seen from a distance the aspect is that of a low ridge with occasional elevated peaks. Portions are very abrupt and precipitous.

The ridges and higher parts are characterised by fine open woods, with many noble specimens of the cedar; but the valleys or ravines are often crowded with such an excess of bushes and creepers as to render progress irksome in the extreme.

The view from Tamana (1025 feet) possesses a peculiar charm. It is by far the most comprehensive in the island. The eye luxuriates in every shade of the richest greens; a vast extent of woodland, from eastern to western sea, from northern to southern hills, without the slightest trace of cultivation, save where the scarlet flowers of the "madre del cacao" mark the winding course of the Caroni. Scenery more sublime may be readily obtainable, but for loveliness of hue, for exuberance of vegetation, this is a prospect which can scarcely be surpassed.

The southern littoral range is not so continuous. The slopes of the hills are in the highest degree precipitous. There are no points where prospects can be obtained, the density of vegetation limiting the circle of vision to a short radius.

WELLS AND SAWKINS. *-Geology of Trinidad.* Longmans.

For exquisite descriptions of tropical vegetation of Trinidad see Kingsley, *At Last*. Macmillan.

A Trinidad Swamp

I determined to visit Oraponche, celebrated for its lagoon, an immense swamp many miles in extent. The lagoon can only be entered with the flood-tide, so we procured a boat next morning at seven o'clock. We proposed to eke out the provisions we carried in the boat by magnificent oysters.

We entered the canal from the sea. It was very narrow and the banks on either side were lined with mangrove trees. From the canal many channels lead into the great lagoon, so intricate and so overgrown by mangroves as to be extremely difficult to penetrate. The one chosen by our boatman was so narrow, and so beset by the roots

interlaced with each other, that we had to cutlass our way and then drag the boat by main strength. The water had an abominable foul smell, was slimy on the surface, and had large bubbles floating on it. At length we reached the great lagoon, a level space of three or four miles broad, and running 10 or 15 miles into the interior. The whole was bounded by the high woods. We were in a channel of clear salt water, 30 feet wide, fringed by dwarf mangrove bushes with patches of rushes and sedge.

The lagoon is an immense plain, exactly on a level with the sea, which at high water finds its way up through many inlets and covers the surface, leaving at low water a mass of rich alluvial mud, the resort of wild-fowl. It is intersected by channels of deeper water. From this chaotic mixture of mud and water spring an infinity of islands, few of which can be trodden with dry feet. There are many tall trees on them, generally so festooned with creepers that the original character of the foliage is lost, whilst from every elbow of the branch spring aloe-like parasites. The scene was curious enough, but I cannot say there was any particular beauty in it.

At the turn of the tide we rowed back. The only sounds that broke the silence was the popping and crackling of the oysters as the tide left them dry. We were carried down to the sea by the force of the tide alone, so rapid is the eflux.

C. W. DAY.—*Five Years in the West Indies*. Colburn.

For the social condition of Trinidad see FROUDE, *English in the West Indies*, chs. iv.-viii. Longmans.

The Pitch Lake of Trinidad

Our proximity to the Pitch Lake was announced by the fetid smell of the hard black roads, formed of bitumen and clay; and a quarter of a mile brought us to the margin of the lake itself, looking like an immense black swamp, intersected with narrow canals of water, meandering

in all directions, and interspersed with clumps of low shrubs, reeds, and rushes.

The whole surface of the lake was hard enough to walk on with perfect impunity, though standing still in any one place for five minutes the heels of one's boots sank in an inch or so, but in merely walking over it, the feet made no impression whatever. The canals were, in no case that we saw, more than a couple of feet in depth, or four feet in width, averaging much less. They were filled with clear, brown, tasteless water.

The area of the lake may be a mile in breadth, by a mile and a half in length. It is oval, and has its boundaries perfectly defined by a belt of forest. The smell is fetid enough. Its depth cannot from the nature of the material be ascertained, but wherever we stood, the slight indentations of the surface were instantly filled with water. There is little doubt that underneath the bituminous exudation is incessantly in action, and that it coagulates on the surface from the influence of the atmosphere.

I saw the Pitch Lake again in a different aspect. Being the rainy season, the Chaudière, or place where the pitch is soft, was quite inaccessible. Some of the pools were 5 or 6 feet deep and the water was quite limpid and fit for bathing in.

C. W. DAY.- *Five Years in the West Indies*. Colburn.

See also Wells and Sawkins, *Geology of Trinidad*, p. 140; Kingsley, *At Last*, chap. viii. etc.

II. CENTRAL AMERICA

From the Coast to Guatemala City

THE coast range after leaving Acapulco presented a softer outline and looked green and fertile to us, accustomed as we had been of late to the rugged, bare mountain chain, which, though doubtless full of mineral wealth, bore a wild and dreary aspect. On the following day we sighted the first of that wonderful series of volcanoes, whose system is developed in its grandest form in Guatemala. On the morning of the twelfth day out from San Francisco we rode at anchor a long way from shore in the little surf port of San José. Three great volcanoes, Agua, Fuego, and Pacaya, raise their huge forms 70 miles or so inland, barring the way to the city of Guatemala, which lies on the other side.

The country round San José was mere jungle, but bright creepers ran over the tangled undergrowth; here and there a gnarled ceiba stretched out its shady branches, laden with mosses and giant arums. Clouds of butterflies hovered over the half-dried-up bed of the stream, and as they settled on its moist banks resembled clusters of flowers.

As we approached Escuintla, the half-way village where we were to spend the night, signs of civilisation increased. There were patches of sugar-cane, little gardens with a few vegetables, and an occasional stand by the roadside, with fruit and balls of lime for sale. In one small clearing there was a man actually at work ploughing, and

this is how he ploughed and the instrument he used. The curved branch of a tree, shod at the extreme point of the lower limb with a piece of iron, and with a beam attached to the upright limb, formed the plough. To this beam two oxen were yoked, which the man directed with one hand by means of thongs attached to their horns, while with the other he guided the plough. And thus he scratched away at the ground, never dreaming of economising his resources by attending to the depth rather than the extent of his furrows.

From Escuintla the road commences to climb successive plateaus. As we ascended it grew more picturesque. On our left was a wall of rock covered with ferns, which grew luxuriantly in the moisture caused by the water that trickled down in every direction. Little ravines which cut through the hillsides here and there were full of wild plantains and arums. On our right, below, was the river Michatoya, watering a fertile plain, and beyond were the mountains. Less and less tropical grew the scenery. The soft stretches of meadow through which flowed the river, its banks lined with osier and willow; the fields of maize, which might have been wheat; the mountain peaks and the undulating hills clad with pines,—were all reminiscences of home. A close inspection revealed cane plantations and tropical shrubs, but they did not obtrude themselves sufficiently to destroy the illusion.

After some hours we reached a lofty eminence and looked down upon Amatitlan. The long, narrow streets, consisting of low red-tiled cottages, lay in a deep valley surrounded by abrupt mountains. A curious appearance was caused by numerous high mud—*adobe*—walls, carefully thatched, enclosing a considerable extent of ground, which constituted the nursery gardens of cochineal. Fields of nopal, the variety of cactus on which the insect feeds, extended in every direction, each surrounded by a mud fence. These nursery gardens are used during the wet season. The thatched roofing over the wall forms a shed which is open on the sunny side, and in it the insects are pre-

served on nopal leaves and breed there. Rain is fatal to the young insect, and although it is said that if it escapes injury during the first ten days after being attached to the plant it has a fair chance of reaching perfection, yet many an owner of a nopal plantation has gone to his field after a heavy shower only to be met at the gate by a red stream, indicating the loss of his crop. In Amatitlan the female is left on the leaf long enough to produce a second crop annually; the second, which is much heavier than the first, is all clear profit, the first paying all expenses. The insects when gathered are spread out on flat trays covered with thin cloths and put into stoves. When dried they are sifted, packed in bales, and are ready for the market.

As we ascended the steep road leading out of the valley, the view on looking back was superb. The wild garden of the great mountain, pierced with shadowy ravines and with bare crags falling sheer down to the edge of Lake Amatitlan, was in strange contrast to the rounded hills and the cultivated gardens of the rest of the valley. For about three leagues we wound our way slowly up the mountain, now passing through a narrow defile or crossing the bed of a fast drying-up stream. At last the volcanoes were no longer in our front. We had passed them and reached the plateau, on the other side of which lay the city of Guatemala, three leagues away. This table-land, 5000 feet above sea-level, is a vast green plain, dotted with trees and plots of maize, with an occasional small coffee plantation. Pretty white villages nestle in the surrounding hills and cattle wander over the pastures.

J. W. BODDAM-WHETHAM.—*Across Central America.* Hurst and Blackett.

By permission of Messrs. Hurst and Blackett.

Guatemala City

From the Cerro del Carmen a most beautiful view of the city is obtained, especially at sunset. The steep hill on which stands the Church of the Carmen, one of the most ancient in the country, is grass-covered and of no great elevation, but made picturesque by the outcroppings of quartz and by the oriental appearance of the old edifice, with its cupola, surrounded by a grey stone wall, which crowns the summit. Behind the church the plain stretches away to ranges of purple hills, already changing to a rose-pink by the light of the setting sun. On either side are the outskirts, with cultivated patches of garden produce laid out in squares and parallelograms and fringed with plantains. Turning to the south-west, the volcano of Pacaya is exactly in front of us; at our feet lies the city, a mass of reddish-brown roofs interspersed here and there with great white churches and convents, whose domes and turrets stand out in giant relief contrasting with the low flat tops of the surrounding houses. As a precaution against earthquakes, the houses, as a rule, consist of a single ground-floor; large gates or doors open into the courtyard—*patio*—which is surrounded by a broad verandah on to which the rooms open. The windows facing the street are heavily barred with upright iron rods, forming a balcony almost overhanging the side-walk, in whose cushioned depths sit the ladies of the house like birds in a cage.

The hills which bound the plain on our left are indescribably soft and beautiful, the deep, shadowed ravines showing to advantage the bright green of the sugar-cane and the darker smoothness of the coffee plantations. But the grandeur of the scene is centred in the three towering volcanoes that rise sharp and distinct against the sky, far beyond the city. So sharp and distinct is the symmetrical outline of Agua on the right, the serrated ridge of Fuego, and the isolated cone of Pacaya, that it

seems impossible that the two former can be nearly 30 miles away and the latter half that distance. No mountains that I have ever seen have left such an impression on my mind as these volcanoes: their majestic loneliness and grand repose strike one with solemn awe.

J. W. BODDAM - WHETHAM.—*Across Central America.* Hurst and Blackett.

For tropical produce in the market of Guatemala see *ibid.* p. 21.

For the rich valley of Coban, *ibid.* p. 230.

For the wealth of tropical flowers, *ibid.* p. 228.

By permission of Messrs. Hurst and Blackett.

Nicaragua

Geographically and climatologically Nicaragua is divided into two distinct zones by the chains of the Cordilleras, which, more or less broken and with numerous flanking spurs, traverse the republic in a north-west and south-east direction, parallel to the Pacific coast. On the eastern slope we find a wild and unexplored country, covered with a dense and almost impassable forest, inhabited only by a few scattered bands of wild Indians, except on the immediate coast of the Caribbean Sea, where are found the Mosquito Indians and Caribs, negroes from Jamaica and other West Indian Islands, and a few Kroomen negroes from the west coast of Africa, brought originally to Panama to work on the canal. There are white settlements at Greytown and Bluefields. All the civilised portions of the country lie on the western slope and in the north-western part of the republic, where the Nicaraguans proper live, and where are to be found the large cities and cultivated farms and haciendas.

All the large houses and stores, business blocks, etc., in the cities are built almost universally of mud walls, nearly if not quite 3 feet thick, and almost universally of only one storey in height. These buildings are very cool, and are built with large doors opening from the rooms directly on the street in front, and into the *patio*, or garden, on the

inside. The rooms are all built around this *patio*. *Adobe*, or sun-dried bricks, are also used. The outside and inside are stuccoed, and the surface looks very well.

The native industries are unique. They comprise the manufacture of fine hammocks and straw hats, nearly as fine as the Panama; jewellery and silver work made by the native goldsmiths; the making of coarse pottery, small images, and vases by the Indians; the carving of *jicaras*, a hard-shelled gourd, and coco-nuts, which are very artistically executed. A great many roofing tiles are also made. The Nicaraguans make a coarse brown sugar, very heavy, but there are no sugar refineries. Cattle-raising is a thriving industry, and thousands of fine cattle roam on the plains, or *llanuras*, in the north-western provinces. Great quantities of cigars are made in the republic, nearly all of which find a home market, and nearly every poor family in the towns counts this as one of their ready sources of income. They raise a very good tobacco. The country people make all their own soap. They generally make their own country houses of bamboo canes, very neatly interlaced, and covered with palm-leaves. These houses they make very ingeniously without the use of a single nail, the frame and the roof-covering being securely lashed with bejuco vines, which grow in great abundance in the woods and are very strong and durable. They make also rubber goods, such as blankets or sheets, bags, pouches, etc., by coating cotton cloth with the native rubber, which do very well for several years' use. They make also large and small canoes, and large *bungos*, or sail-boats, the canoes being neatly hollowed out of a single log.

Journal of School Geography, 1897.

By permission of Professor R. E. Dodge.

Economic Trees of Nicaragua

There is untold wealth in the forests of Nicaragua. There are 40 trees furnishing industrial or medicinal

gums, balsams, resins, textile materials, oils, extracts, essences, food and drink and spices, besides 74 varieties of fruit trees, of which 17 are wild and 57 cultivated. It would be impossible even to enumerate all the varieties for want of space. Only one or two of them have English names. Of these, mahogany, cedar, pine, and live oak are well known. I did not see any pencil cedar in the country. There is also the almendro, or ibo (wild almond), called in Jamaica Break-axe (*Quebracho*), which grows to an immense size, and may be likened to live oak, but is very much harder, stronger, harder to split, and more durable. It is almost impossible to cut this tree down with an axe, and it is equally hard to drive a nail into it. We used to dispose of them in clearing the right of way for the Nicaragua Canal by digging under the roots and blowing them up with dynamite, and then cutting them up with cross-cut saws. It has an intertwining grain, and although so hard to work, is almost as strong and durable as iron. In Paraguay it is called the king of hard woods. It bears an almond from which ibo oil is made, which is much esteemed in pharmacy. Then there are the cottonwood, rosewood, and granadillo, wild tamarind, of which the fruit is well known, and the wood used for making wheels, bouts, etc., hard and strong; the sapodillo, a very hard wood to work and said to be indestructible by sea-worms, very durable. Of the dye-woods, there are the champêche, or logwood, Brazil wood, the fustic, the mulberry, the dragon's blood, and many others.

Of the trees furnishing industrial and medicinal gums there are the rubber tree; the gutta-percha; the pala de ceibo, or vegetable wax-tree; the annotto, used for colouring butter and cheese; copaiba, balsam of Peru, liquid amber, and a species of gum arabic; cinchona, copal, rosin, and turpentine; coyol palm oil, coco oil, castor oil, sesame oil, cacao oil, made from the fruit of the plant; corozo palm oil, made from the very abundant nuts of the corozo palm, which make an excellent soap; sandal-wood

oil, and other oils, gums, and resins too numerous to mention. A tree which cannot be classed with the others is the milk or cow-tree, which grows wild and produces, when cut, a milk which the eminent traveller Humboldt used in his coffee. It is very common on the line of the canal. It contains a great deal of wax, and should be boiled to coagulate the wax before drinking.

The vanilla bean grows wild on long vines in the woods. Also a cinnamon tree, of which the bark is used. The nutmeg is cultivated successfully in British Honduras, where it was introduced from Jamaica; also the pimento or allspice. Pepper grows wild. This country is eminently adapted to the raising of spices, and there is no doubt but that all those raised in the East Indies can be raised here. Of the fruit trees, the orange, lemon, and all others of the citrus family flourish, especially on the west side and interior. On the west side as fine fruit is produced as the best in Florida. The cacao is one of the principal sources of wealth of the country, and the prepared cacao always brings a high price. The coco-nut grows on the sandy coast in abundance. The bread-fruit grows everywhere, and the fruit is very good and nutritious, boiled or baked. It requires a little over four years from the slip before bearing, and yields two crops a year. The fruit weighs up to thirteen pounds. Mangoes, pawpaws, aguacates, or alligator pears, sapodillos, and an almost endless variety of tropical fruits flourish. Coffee is the principal crop of the country, and is grown on the highlands of the north and north-west.

Journal of School Geography, vol. i. 1897.

By permission of Professor R. E. Dodge.

Mahogany Cutting

The mahogany is a very fine tree, growing frequently to 27 feet in circumference, the trunk being without branches for 80 feet. It has a thick black bark with deep longitudinal ridges. The inside bark is stringy, soft, and

pink, excessively bitter and astringent, and is often used to tan leather. The leaf is 3 to 4 inches long, oval, glossy, dark green. It bears brown winged seeds, very much like those of the sycamore tree in Europe. The largest and soundest trees grow on low, often swampy ground, but the hardest wood with the finest grain only on dry or hilly land. The mahogany never grows without spurs or buttresses, which are sometimes of great size, joining the trunk at 20 feet above the ground; and contiguous spurs form recesses capable at times of sheltering twenty men. Its range of growth on the mainland extends from Yucatan to Blewfields River, south of which it is not found; and I believe it is confined to the watershed facing the Caribbean Sea.

The scene of operation presents a most picturesque bit of landscape. The long vista of the truck pass admits a blaze of sunlight into the dark forest, and at the end of it is a small cleared space, surrounded by foliage, in the midst of which stands the great black trunks of one or two mahogany trees, their tops waving in the cool trade wind, while the air below quivers in a sultry calm. Round the huge spurs of the tree is reared a slender stage of poles, and mounted on this, often 20 feet from the ground, two brown figures, naked to the cloth round their waist, ply with measured stroke the glistening axe, from which chips fly in all directions. Through the long hours the blows fall on the tree; already a huge gap is opened in the red wood; now and then a faint sound is wafted from the distant part of the forest where another party is similarly occupied, and is immediately answered by all within hearing; then the men ply their strokes with renewed vigour. On one side, where a great trunk has already measured its length on the ground, and lies prostrate amid a ruin of torn branches, a party of six men, three on each side, draw the long saw backwards and forwards with a measured pull. Their brown backs, covered with sweat, glisten in the sun; beside them is a little fire of mahogany chips, and the pipe and the joke are passed

merrily round. Presently a loud crack is heard, and the axe-men are seen hastily scrambling down from their stage. The fellows seated so comfortably at their saw have already fled; a volley of cracks succeed; the lofty top of the tree slowly inclines over, and the monarch of the forest yields to its fate with a roar of broken branches and a thump that shakes the earth for half a mile round about.

When the trees have been felled and cut into logs, and the passes cleared and bridged, the trucks are brought into requisition. These are immensely strong, framed of timber, with broad, solid wooden wheels. From twelve to thirty bullocks are yoked to each, according to the size of the log, and there are generally six or eight trucks employed on a camp. They all start from the camp at two in the morning, making a most picturesque party, torches blazing, men shouting, cattle lowing, and wheels creaking, while the forest is illuminated by the red glare of the pitch-pine torches. On arriving at the logs, a gang of men lay strong beams from the ground to the edge of the trucks, and roll the logs up them on to the trucks. All the logs are first trucked out of the branch passes to their junction with the main pass, and then drawn down to and thrown into the creeks or rivers. In soft ground a sledge called a slide is employed instead of a truck to convey the logs. The trucking is done in the dry season, and by the time it is completed the rainy season has commenced. When a freshet comes on, whether it be night or day, the men at once commence "driving" the logs. Each man takes charge of two or three, and seated on one he guides them with a long pole past the rocks and shallows as he drifts down the creek. He is wet during the day with the cold creek water, and at night sleeps in a damp bed, for it is impossible to keep dry in the open thatched huts which are hastily built as night comes on. The log on which the man rides is continually rolling over and throwing him into the water, and after a long day's wetting it is ludicrous to see the grim faces of the men

every time they tumble into the water. Finally they become so chilled that they are shivering and almost powerless, and nothing will induce them to jump into the water to release a log that has grounded.

The logs often get jammed between rocks, or, if the flood is high, among the branches and trunks of the trees. Often it is impossible to distinguish the creek from the flooded forest, and the freshet, subsiding, leaves the logs stranded in the bush, from which they have again to be rolled into the creek. Generally several freshets are necessary before all the logs are driven to the main river, where in a secure eddy they are stopped by a boom of logs, chained together and fastened by trees.

The logs are made up into rafts and floated to the mouth of the river, where they are rolled on shore and squared with the broad axe. Then they are tumbled again into the river, made up into small rafts, and drifted with the ebb tide out to the ship, which is riding at her anchors off the mouth of the river.

C. N. BELL.—*Tungweera*. Arnold, London.

By permission of Mr. Edward Arnold.

Cacao Plantations

Cacao plantations can only be formed successfully on virgin lands—that is to say, where no previous crops have been cultivated. The virgin forest, consisting of a dense impenetrable mass of vegetation of all kinds, is first cleared by the coolies, and the ground is then prepared for the reception of the cacao pods, which are planted in rows called “cacao-walks.” The first protecting crop that is grown generally consists of sweet potatoes; then yams, then maize, then fruit, in such as oranges, lemons, peaches. Then come the immortels, or madres de cacao, which grow slowly, but which, when allowed to do so, attain an enormous size. As a rule, however, they are cut down as soon as the inoes

trees are supposed to be strong enough to need no further protection. At certain periods of the year the madre or immortal is thickly covered with bright scarlet blossoms, which, mingling and contrasting with the violet-red leaves of the young cacao-trees, the scarlet, yellow, green, and crimson pods, hanging from the stem and lower branches of those of more mature growth, and the richly coloured orange and yellow flowers of the flamboyante, produce a wonderful effect. The young cacao trees have a good many enemies besides the sun—one being the north wind; another the irregular showers that sometimes fall during the dry season; and last but not least, a multitude of destructive little birds, beasts, and insects, among which the parasol-ant occupies a prominent place. The cacao-plants are transplanted three times. At the end of five years they are taken in hand by the European cultivator, who only allows them to bear a light crop during the first two years. At twelve they are fully productive; and they go on bearing for a period of from ten to forty years; though in some cases the time of fruition is greatly extended. In fact, several trees were pointed out to me as being over a hundred years old, and as still producing satisfactory crops. The height of the trees varies between 15 and 30 feet, but some attain a much greater altitude.

The cacao-pods, as I have mentioned, grow on the stem of the tree itself, and on the principal or lower branches, thus producing a very curious effect. Two crops are yielded annually, in June and December; the pods being cut off by means of a *machete* or chopper fastened to the end of a log pole. When cut open, the interior of the pod is found to be filled with small black seeds, from fifty to a hundred in number, embedded in what looks like custard, which, when quite fresh, tastes like the most delicious lemon ice-cream, with a delicate soupçon of vanille-chocolate.

The **LADY BRASSEY**.—In the *Trailes, the Tropics, and the Roaring Forties*. Longmans.

wettin, By permission of Lord Brassey and Messrs. Longmans,

The Western Plateau of Nicaragua

There is exceedingly varied scenery on the western plateau. Besides Ometepe and Mombacho, the majestic mountain landmarks of Lake Nicaragua, there is another series of volcanoes known as the Marabios, and seen to great advantage from the steamer in the passage across Lake Managua. These lava-streaked mountains vary in height from 2000 to 7000 feet, and there are fourteen of them clustered between the lake and the Gulf of Fonseca. Momotombito, an island hummock in the lake at the base of giant Momotombo, is southernmost of the series. Viejo, back of Corinto, lies at the northern bound of this old-time centre of volcanic energy. Momotombo ordinarily has a curling wreath of smoke ascending from its crater, but it was not on exhibition as an active volcano when I passed it. As a mountain of magnificent proportions, symmetry of form, and boldness of outline, it is unrivalled in Central America. The forests extend from the shores of the lake to the edge of the crater, where there is rank grass among the ash-heaps and lava-beds. The little volcano in front of it is a foil for its impressive majesty, and the two mountains once seen across the green level of Lake Managua will linger in the memory as a silhouette of singular beauty.

From this line of volcanoes to the coast there are broad levels, admirably adapted for the cultivation of coffee and cacao. At the base of Momotombo there is a picturesque Indian hamlet, where the railway train is taken for Leon and Corinto. The first stage of the journey is made through a forest track, where there are occasional clearings and glimpses of the volcanoes. As Leon is approached, wild pine-apple fences are seen, with herds of cattle in green pastures. There are cacao and coffee plantations, the shrubs growing in the dense shade of banana and coral trees. Palms become more conspicuous as the coast is approached. The plain of Leon, bounded by the volcanoes

and the sea, has great natural beauty. If it were in a high state of cultivation, and the scrub forest were cleared away, it would be the loveliest garden in Central America. Corinto is the chief port of Nicaragua, and the western terminus of the railway and inland water system of transportation. It is an insignificant town on a low, marshy island.

I. N. FORD.—*Tropical America*. Edward Stanford.

By permission of Mr. Edward Stanford.

The Nicaragua Canal

Commencing at Greytown, it passes through an easy level country for about 20 miles to the San Juan River, which is to be dammed up at Ochoa by a dam 1900 feet long by 70 feet high to form a portion of the canal. From Greytown to Lake Nicaragua the distance is 96 miles; there will be three locks before the lake is reached, of an average lift of 35 feet 4 inches, the surface of the lake being about 110 feet above the sea-level. The route is then, for 56½ miles, through the lake, which is 110 miles long and 40 to 50 miles wide. On the Pacific side of the lake the difficulties are greater, as over 110 feet has to be got down in about 17 miles. Three locks of an average lift of 36 feet 8 inches will be required; it is proposed to make these locks 650 feet long by 80 feet wide. This is a greater lift than in any locks yet constructed, but the American engineers consider themselves equal to the occasion, and, no doubt, given time and money, they will be able to carry out the design. Difficulties similar to those on the Panama Canal will here be met with, but to a much smaller extent; near the Pacific the mountain range will have to be cut through; involving a cutting in some parts of 110 feet deep. The total length of the canal is about 169 miles, but only 27 miles of this actual cutting; the remainder is through the rivers and the lake, and as a greater speed can be attained on the lake than

on the canal, another advantage is gained by adopting this route.

The canal is to terminate in the harbour of Brito, on the Pacific Coast, where a breakwater has to be made to enlarge the harbour. The minimum depth of the canal will be 30 feet, and, except where cut through the rock, wide enough for vessels to pass each other. It is estimated that the cost will be about £15,000,000, and that it can be completed in seven years, and when completed it is said the passage through from sea to sea will be made in twenty-eight hours.

The saving in distance for steamers by this route will be :—

From New York to San Francisco	.	.	.	8267 miles
" " " Melbourne	.	.	.	3000 "
" " " Valparaiso	.	.	.	3400 "
" " " Yokohama	.	.	.	6827 "
From Liverpool " San Francisco	.	.	.	5800 "
" " " Yokohama	.	.	.	2600 "
" " " Valparaiso	.	.	.	1200 "
" " " Auckland	.	.	.	750 "
" " " Hong-Kong	.	.	.	1265 "

1. Bowles. . . "The Nicaragua Canal." *Journal Manchester Geographical Society*, 1896.

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Costa Rica

With the exception of San Salvador, Costa Rica is the smallest country of the New World. Its area cannot be accurately defined, owing to its unsettled boundary with Colombia, but, exclusive of the part in dispute, is about 21,000 square miles.

The mountains of Costa Rica are not a continuous Cordillera, although, in general, they extend from the frontier of Colombia to within a few miles of Brito, at the south-western corner of Nicaragua. Between the northern

volcanic section and the more regular southern Talamanca range is found a depression about 20 miles broad, from $9^{\circ} 40'$ to 10° north latitude, and a little less than 5000 feet above sea-level at the water-parting. To the eastward, through this gap, and in a broad and deeply eroded valley, runs the tumultuous river Reventazon, and to the westward the Rio Grande de Pirris. Bounding the depression on the south, the Chirripo Grande mountain mass sends off two immense flanking counterforts, one east to the Atlantic shore, and one west to the Pacific coast. A part of the latter, lying between San Marcos and Santa Maria, is, for a length of about 8 miles, known as the Dota Ridge. This entire lofty, transverse, and precipitous barrier almost forbids communication between the northern and southern halves of the republic, and must at all times have had a marked influence on the movement of races in this part of Central America.

On the whole, the mountain ranges and masses of Costa Rica lie nearer the Pacific coast than the Atlantic; but when they were first uplifted such probably was not the case. The Pacific slope is still bold to the water's edge, margined almost throughout by headlands and lofty hills, and offers fewer evidences of the extensive denudation and erosion so characteristic of the Atlantic side; for here it is that the mountains present their bold front to the north-east trade winds and say "Thus far shalt thou go and no farther."

I know of no mountain barrier from Cape Horn to British Colombia, on either side of the continent, not even the eastern Andean slopes of Ecuador, Peru, and Bolivia, against which the rain-laden winds wage such ceaseless and relentless warfare. I rode from San José across the pass 1500 metres (4920 feet) above sea-level, between Irazu and Barba nearly to Carillo. The ride to the summit was easy; but rarely in the South American Andes have I seen such perpendicular, dark, and profound gorges as I found carved out by the storms on the northern slope of Irazu.

The forests abound in rich and valuable timber trees, among them mahogany and cedar, and offer a great number of types. Probably no equal area of the New World possesses such infinite diversity of floral forms. Nature here exhibits herself in her most riotous and prodigal mood, not alone in the flora but the fauna of the country. As regards the latter, there are 725 species of birds known there—more than twice the number found in all Europe. Many varieties of the parrot family enliven the forests. Sixty-eight species of mammals have been enumerated, among them rare species of the monkey tribe, the jaguar, puma, ocelot, the coyote, the Virginia fox, weasel, otter, wild boar, tapir or danta, mountain buck, the great ant-eater, two species of the armadillo, and besides others, a migratory vampire bat of enormous size. Calvo tells us that the latter at times invade the south-east of Costa Rica in millions, at intervening periods of from five to fifteen years, and cause such ravages among domestic animals that the inhabitants are obliged to emigrate and take their live stock with them. In a single night the bats bleed the strongest ox to death, as well as cats, dogs, and fowls.

The market of San José presents a variety of fruits, cereals, roots, and vegetables, cultivated and wild, which, it may be safely said, rival in number and quality that of any other tropical market in the world. Never have I eaten a potato equal in fruity flavour to that grown in the ash-impregnated soil on the south-western slope of the volcano of Irazú. The pine-apples on the northern slopes of Barú I found superior even to the much vaunted ones of Guayaquil or Bahia de San Salvador, while the aguacates were matchless in size and flavour. It is notable that when seeds from temperate lands are planted in Costa Rica soil, the first fruit grown from them is large and delicious, but its progeny rapidly degenerates and becomes small and insipid.

COL. G. E. CHURCH.—*Geographical Journal*, July 1897.

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San José

Nearly one-third of the population of the country is in the province of San José, a broad expanse containing the main coffee plantations, at short distances from the principal cities, where the owners generally live. The wealthiest, most prosperous, and most conservative of the towns are Heredia and Alajuela, which are connected with the capital by a railroad. What we shall say about San José applies more or less to all Costa Rican cities. In this magnificent neighbourhood the country is studded with fruitful plantations. Here the true population of Costa Rica dwells, since here are found the hardy, simple toilers, who wrest from the earth its agricultural products, the true wealth of the soil. An air of ease combined with antique simplicity characterises the majority of these villages. The city of San José at once gives the impression of thrift, not unlike the cities of the United States. The traveller sees two-storey houses, wide side-walks, and electric lights. In the centre of Walker's Park has recently been placed a handsome monument to commemorate the defeat of the filibuster Walker. Educational facilities are excellent: there are high schools, a school of law, several colleges, public libraries, etc. It is safe to say that the number of teachers in Costa Rica far exceeds the number of soldiers. The well-kept hotels, like most private residences, are built around a beautiful courtyard, from which every room in the house receives moist cool air, charged with natural perfumes of carefully cultivated flowers. Costa Ricans mingle work and play in the most delightful way; in the cities amusement is often considered more important than business, and means of recreation are abundant. San José has a modern theatre not equalled in Central America.

RICARDO VILLAFRANCA.—*National Geographic Magazine*, 1897.

By permission of the National Geographic Society.

Across Costa Rica

No climate can, I imagine, be more favourable to fertility and to man's comfort at the same time than that of the interior of Costa Rica. The sugar-cane comes to maturity much quicker than in Demerara or Cuba. There it should be cut in about thirteen or fourteen months from the time it was planted; in Nicaragua and Costa Rica it comes to perfection in nine or ten. The ground without manure will afford two crops of corn in a year. Coffee grows in great perfection and gives a very heavy crop. The soil is all volcanic and indescribably fertile. And all this has been given without that intensity of heat which in these southern regions generally accompanies tropical fertility. In speaking thus I refer to the central parts of Costa Rica only—to those which lie some thousand feet above the level of the sea. Along the sea-shores, both of the Atlantic and Pacific, the heat is as great and the climate as unwholesome as in New Granada or the West Indies. It would be difficult to find a place worse circumstanced in this respect than Punta Arenas.

Punta Arenas—Sandy Point—is a small town and harbour situated near the top of the Bay of Nicoya. The sail up the bay is very pretty, through almost endless woods stretching away from the shores to the hills. There is, however, nothing grand or majestic about the scenery.

The scenery round San José, the capital of Costa Rica, is certainly striking, but not sufficiently so to enable one to rave about it. There is a range of hills running nearly round the town. Two little rivers run by it which here and there fall into romantic pools. The valley of San José, as it is called, is 4500 feet above the sea, and consequently, though within the tropics, the climate is good, and the heat, I believe, never excessive.

ANTHONY TROLLOPE.—*The West Indies and the Spanish Main.*
Chapman and Hall.

Across the Isthmus of Panama

Colon, the Atlantic city of the isthmus, is the only settlement on the island, which on some charts is called Manzanillo. It is three-quarters of a mile long, by about one-third of a mile wide, with a surface slightly above the sea-level, and is connected with the mainland by a railway embankment.

Leaving Colon, we crossed the embankment leading to the mainland, the Spanish Main of early writers. On our right there was an immense mangrove swamp, one mass of green; beyond the swamp was a little hill; then more lowland. The tropical jungle became thicker and thicker; in places it was so thick as to be absolutely impassable. Here and there were stretches of banana. These were interspersed with palms and other vegetation. Here and there a native hut could be seen on the hillsides. It was not long before we were at Gatun. To our right we caught a glimpse of the river Chagres, a peaceful stream in the dry season, but often, during the long wet season of the Isthmus, a huge, destructive volume of water. The railway there follows the left bank of the river as you approach the Pacific. Opposite the small station, and just across on the opposite bank, was the Indian hamlet of Gatun. In those days (1880) it was a mere collection of huts built of bamboos, thatched with palms or oleanders. We gradually approached the bridge of Barbacoas, 612 feet long. The river at this point in the dry season is a peaceful shallow stream, perhaps 200 feet wide. During one of the floods in 1878 the valley of the Chagres was overflowed, and there were 12 to 18 feet of water over the railway. Beyond the bridge were trees unfamiliar to me and creepers in flower; orchids and palms also claimed attention. The great luxuriance and density of the vegetation, including palms, bamboos, and cotton-woods, became noticeable. The cotton-wood especially, a huge tree with tremendous flanges at its base, is a characteristically tropic form of the native flora.

Matachin is the mid section of the railway, and there the trains crossed. Not far from Matachin on the right is a once famous but now forgotten hill. It is named Cerro Gigante or the Big Hill, and from its crest Vasco Nunez de Balboa first saw the Pacific in the early morning of 13th September 1526.

Culebra is the highest point of the railway, 238½ feet above the level of the Pacific. It is on the crest, or divide, as it would be termed in the Rockies. The density of



CULEBRA CUT, PANAMA.

the vegetation may be gathered from the fact that rank grasses and undergrowth crowded down to the very rails. Men are constantly employed in cutting it away. It has been stated that if the Panama railroad remained unused for six months the whole line would be grown over with tropical jungle. Having passed the crest, we commenced descending. In the distance we saw Mount Ancon, a small volcanic peak. It is just back of the city of Panama. Then we came upon more swamps and more mangroves

and black soil. Here and there were great arms of the sea, or "sloughs," as they are termed in California. At high water they are filled; at low water they resemble great muddy ditches; they connect with the Rio Grande, some two miles back of the city of Panama. Passing a small Indian village on the outskirts of Panama, we drew up in the station of the city.

WOLFRED NELSON.—*Five Years at Panama*. Sampson Low.

By permission of Messrs. Sampson Low, Marston and Co.

For the city of Panama see *ibid.* chs. iv., vi., vii.

An interesting account of the same route will be found in Sir M. Conway, *Climbing and Exploration in the Bolivian Andes*, chap. ii. Harper and Brothers.

III. SOUTH AMERICA

Contrast between North and South America

THE contrast between North and South America is remarkable. Nature was in her kindest mood when she created the former—gave it vast and fertile plains; low and readily transitable mountain ranges; extensive systems of navigable lakes and rivers, the latter not too difficult to bridge; great forests of the most useful timber; immense mineral wealth, including an abundance of coal and iron; a coast-line offering numerous excellent harbours easily accessible from the interior; and a temperate, inviting climate over almost its whole area. It is a land where man seems to live with Nature on friendly terms, and where the wave of humanity, as it rolls westward, encounters no obstacle which it cannot readily overcome. How opposite to all this is South America! It lies mostly within the tropics; its fertile plains, except those of the Argentine Republic, are difficult of access; it is a formidable task to scale and cross its mountain ranges; its rivers, with rare exceptions, are of violent flow and full of obstacles to navigation, and its largest ones not within the limit of practical engineering to bridge; its vast forests are hard to work and frequently impenetrable; its mineral wealth, immense in nobler metals, includes but little coal and iron; its coast has but few good harbours, and these are almost all mountain-locked; its climate, although in many parts delightful, is uninviting over extensive regions; the forces of nature are so vigorous that man can seldom

count upon the unqualified control of them, and, in general, they confer generous reward only upon well-applied and persistent energy.

COL. G. E. CHURCH.—*Geographical Journal*, April 1901.

By permission of the writer and of the Royal Geographical Society.

General View of South America

Let us examine briefly the geographical features of South America. In the north are chiefly wooded, well-watered, rolling plains, with two great mountain systems, and two important river basins, the Orinoco and the Magdalena. The Venezuelan mountain range, as also its great river, with its giant tributary, the Rio Meta, trends east and west, at right angles to the Andean chain and the Rio Magdalena in Colombia. The Orinoco is obstructed by rapids just above the point where its channel turns to the eastward, but the Meta, which empties below the rapids, is open to within 125 miles of Bogota, making a total of 900 miles of east and west navigation, parallel with the Caribbean sea-board, at an average distance of 200 miles south of it. From the head of navigation on the Magdalena to Bogota is only 80 miles, so that there is only a space of 205 miles between the heads of navigation on these two river systems, and railroads are now projected which will put Bogota into communication with them both. It is a familiar fact that water communication alone will not lead to the development of a country's resources, and that rail communication alone will not be nearly so beneficial as when both means of transportation are available in competition with each other. So here, in northern South America, Venezuela, and Colombia, to wit, a rapidly expanding group of railroads will develop a long triangular strip of territory, comprising an area of nearly 1,000,000 square miles, with water competition on every side at a maximum distance of 150 miles from any point,—ideal conditions, which,

combined with the almost paradisiacal climate, the abundance of wood, of coal, of iron, of water-power, and its fertile soil, will make it ultimately one of the most prosperous regions on the earth.

Next to this, on the south, lies the wonderful valley of the Amazon, 600 miles in width, 2100 miles in length from the Andes to the sea. Through this vast alluvial plain the Amazon winds back and forth, affording 3000 miles of navigable channel, while its tributaries in Brazil, Peru, Bolivia, Ecuador, and Colombia swell the total length of navigable waterways to 50,000 miles. The future of this great valley is obscured in uncertainty. It is so well provided with natural means of communication that it will not soon pay to incur the enormous cost of building railroads through these almost impenetrable forests. The one important product of this valley is rubber, and rubber orchards will soon give employment to a large population, but commerce here will be served by steamboats for many decades. This river system may, however, serve as a regulator of freights from Bolivia, Peru, and Ecuador, and perhaps even from portions of Colombia, as railroads lead to the development of the eastern districts of those republics.

South of the valley of the Amazon are two other regions of Brazil, marked off from each other by sharply distinguishing characteristics. One is the long, narrow, wooded sea-coast, the most populous portion of the country; and the other is the vast expanse of semi-arid plains which reach half across the continent, to the confines of Bolivia. The coast lands furnish coffee, cocoa, sugar, and numerous lesser tropical products; the arid plains are already the homes of countless herds of cattle, but having no means of communication with any commercial centres, this region contributes nothing to-day to the wealth of the nation. But every year the railroads are creeping farther west; the telegraph has pushed on ahead; and, just as in the United States, the march of empire in Brazil is towards the setting sun.

Stretching from these arid plains 2000 miles southward is the mighty valley of the Rio Paraguay, watering a fertile country, blessed with a salubrious climate. This river is paralleled by railroads for over 300 miles, and the present systems are extending northward on each side of the valley. The broad Pampas of Argentina stretch across the continent from Buenos Aires to the mountains and southwards through Patagonia, a region far less bleak and barren than is generally supposed—a country indeed to be compared with the Red River valley and Manitoba in North America. Seventh and last comes the long narrow western coast, stretching from Colombia on the north to Tierra del Fuego on the south, through 50 degrees of latitude, or 3500 miles in length, the scene of great events through multiplying centuries. It is for the most part a treeless region, rising by successive elevations into lofty plateaus, where a temperate climate favours the cultivation of northern cereals under the very equator itself. Its lands under irrigation are proving to equal those of Southern California, and irrigation projects are attracting deserved attention. Like Southern California, again, its climate is ideal, and the grandeur of its scenery is unsurpassed by that of any country in the world.

COURTENAY DE KALB. — *Journal of the American Geographical Society*, 1894.

By permission of the American Geographical Society.

Distribution of Trees in South America

Confining our view to South America, we should certainly be tempted to believe that trees flourished only under a very humid climate, for the limit of the forest-land follows, in a most remarkable manner, that of the damp winds. In the southern part of the continent, where the western gales, charged with moisture from the Pacific, prevail, every island on the broken west coast, from lat. 38° to the extreme point of Tierra del Fuego, is densely covered by impenetrable forests. On the eastern side of

the Cordillera, over the same extent of latitude, where a blue sky and fine climate prove that the atmosphere has been deprived of its moisture by passing over the mountains, the arid plains of Patagonia support a most scanty vegetation. In the more northern parts of the continent, within the limits of the constant south-eastern trade-wind, the eastern side is ornamented by magnificent forests; while the western coast, from lat. 4° S. to lat. 32° S., may be described as a desert. On this western coast, northward of lat. 4° S., where the trade-wind loses its regularity and heavy torrents fall periodically, the shores of the Pacific, so utterly desert in Peru, assume near Cape Blanco the character of luxuriance so celebrated at Guayaquil and Panama. Hence in the southern and northern parts of the continent the forest and desert lands occupy reversed positions with respect to the Cordillera, and these positions are apparently determined by the direction of the prevalent winds. In the middle of the continent there is a broad intermediate band, including Central Chile and the province of La Plata, where the rain-bringing winds have not to pass over lofty mountains, and where the land is neither a desert nor covered with forests. But even the rule, if confined to South America, of trees flourishing only in a climate rendered humid by rain-bearing winds, has a strongly-marked exception in the case of the Falkland Islands. These islands, situated in the same latitude with Tierra del Fuego and only between two and three hundred miles distant from it, having a nearly similar climate, with geological formation almost identical, with favourable situations and the same kind of peaty soil, yet can boast of few plants deserving even the title of bushes; whilst in Tierra del Fuego it is impossible to find an acre of land not covered by the densest forest. In this case, both the direction of the heavy gales of wind and of the currents of the sea are favourable to the transport of seeds from Tierra del Fuego, as is shown by the canoes and trunks of trees drifted from that country and frequently thrown on the shores of the Western Falkland.

Hence perhaps it is that there are many plants in common to the two countries; but with respect to the trees of Tierra del Fuego, even attempts made to transplant them have failed.

C. DARWIN.—*Voyage of the "Beagle."* Murray, also Ward and Lock.

Distribution of Population in South America

A glance at the map of South America at once reveals the fact that the bulk of its population is massed along the coast. The inhabited zone forms one continuous girdle round the land, extending from the torrid shores of the Gulf of Panama to the ice-bound rocks of the Straits of Magellan. Sometimes, as in Bolivia or at Buenos Ayres, this zone widens out; sometimes, as in Chile and in certain parts of Brazil, it is reduced to a mere strip, enclosed between the sea and the Cordillera; but nowhere does it lose its character as a border, bounded on the one hand by the ocean, on the other by the vast solitudes of the interior. To this general feature there is but one exception. On the shores of the Atlantic, in lat. 35°, the estuary of the La Plata spreads itself out. Into this debouches one of the largest rivers of the world, the Rio Parana, which ploughs its deep and gigantic way through the soil of America, and, aided by its affluent the Rio Paraguay, opens into the very heart of the continent a fine navigable highway "like the sea," the banks of which are as populous as the ocean-coast.

BOURGADE DE LA DARDY.—*Paraguay.* Philip and Son.

By permission of Messrs. Philip and Son.

IV. THE GUIANAS

Venezuela

VENEZUELA may be roughly described as a triangle, with nearly equal sides, one of which is a coast-line of 1500 miles, another an irregular frontier running south from Cape Vela into the heart of the continent, and the third an Andean chain parallel with the maritime range. Within these lines is embraced an area of 632,695 square miles, where room for three Germanies could be found. The mountainous coast belt is the only one which is under cultivation and inhabited by whites. Out of a total population of 2,250,000, considerably more than 2,000,000 is centred in the seven states bordering upon the sea. The cultivated belt has an average breadth of 70 miles, except at Lake Maracaibo, where it is over 100 miles. Beyond this area of population and agriculture there is a broad pastoral or grazing belt extending to the Orinoco, and back of this there is a forest region of great mineral wealth, but thinly populated, and in the main unexplored. Venezuela was the first country on the mainland discovered by Columbus; but it is among the last in the order of industrial development. It is known to be rich in gold, copper, iron, coal, and timber; it has in the Orinoco valley facilities for rivalling the Argentine and Southern Brazil as a grazing country. With railway construction and irrigation on a large scale, it could be converted into the most prosperous state in South America. The

low valleys on the Venezuelan coast are pre-eminently adapted for the cultivation of sugar and cacao, and the high table-lands among the mountains for coffee farming. No sugar is exported, the processes of manufacture being primitive, and barely enough being produced for home market and for the distillation of cheap rum for the natives. Cacao is after coffee the great agricultural staple. France and Germany are the



BOLIVAR, ON THE ORINOCO.

chief markets for cacao, which is of the finest quality produced in South America, ranking with that of Ecuador. The productive zone for coffee begins at an elevation of 1500 feet above the sea. The mountain slopes behind Lake Maracaibo and in the valleys of Caracas and Valencia are the best districts. The coffee belt is large enough to supply the whole American market if it can be brought under systematic cultiva-

tion, and if adequate railway transportation can be provided.

I. N. FORD.—*Tropical America*. Stanford.

For Coffee-growing see p. 122 ; for Cacao-growing see p. 45.

By permission of Mr. Edward Stanford.

The Seasons in Venezuela

There are but two seasons in Venezuela—the wet, lasting from about the middle of April till the first week of September ; and the dry. In the latter season the climate is far from unhealthy, and, except when the easterly breeze drops, the temperature is not unduly warm.

This easterly breeze is the saviour of the Orinoco valley. Every morning, about four o'clock, the leaves begin to rustle, and soon the trees are swaying and cracking in the freshening wind—sometimes half a gale—that sweeps away the swamp mists, searches out and dries up the heaps of reeking vegetation, and generally acts as a great purifier till about eleven o'clock, when it suddenly dies away, and the sun beats down in all his fierce heat on river, plain, and forest. Then the world goes to sleep—not a leaf stirs, not a sound is heard, not a living creature moves, unless it be some tireless, persistent, and perspiring Briton, who refuses to time his incomings and his outgoings according to the great clock of Nature. At two o'clock another whisper runs through the trees, and again the sweetening wind brings life back to the forest, continuing to blow all the afternoon, till it sinks to rest with the sun behind the fiery western clouds.

During the winter months there is but little rain, we had only three wet days in fourteen weeks,—but the constant night dews are sufficient to soak through blanket and clothing, and make every one cross, stiff, and unhappy by morning time. Once or twice at night the cold was too great to permit of sleep in such light covering as we

were able to carry, and the night had to be spent by all of us cowering round the camp fire.

MAJOR S. PATERSON.—*Geographical Journal*, January 1899.

By permission of the Royal Geographical Society.

Distribution of Vegetation in Venezuela

Closely connected with the climate is the distribution of vegetation. The coco-palms and cocoa are confined to the tierra caliente; the banana, yucca, and sugar-cane extend to the upper limit of the tierra templada; and the tierra fria is the land of wheat, oats, potatoes, beans, and peas. Cactuses, as well as mimosas, agaves, euphorbias, and thorny plants of all kinds, occupy all the lower parts of Venezuela that are not well watered. The palm region extends upwards to 3300 feet, and is succeeded by the fern forest, extending upwards to 6000 feet; and above this, up to 7800 or 8200 feet, is the cinchona forest, named from the frequency of different varieties of this tree. The upper limit of this forest varies, but may be placed in general at an altitude of 10,000 feet. Still higher, bushes and herbs are met with, and then come immense pastures where cattle are grazed, and then the region of the Frailejon (various kinds of *Espeletia* of the order of the *Compositæ*), extending up to the snow-line. Naturally these zones are not present in all parts of the Republic; on the Caribbean Mountains the upper ones are absent owing to the lower elevation, while in the Cordillera the palm region does not exist, as the valleys have an altitude of 2600 to 3200 feet. But not only in a vertical direction does the vegetation change. It is also affected by the physical features of the country. Tropical forests and forests of hardier trees are found in the higher mountains, grass-land predominates in the *llanos*, and in the higher parts of the Cordillera meadow-lands are of most importance. And these surface features are by no means clearly marked out from one another; small savanas skirt the streams

in the Caribbean Mountains, and unfruitful tracts occupy no small areas both in Central Venezuela and the Cordillera. The western llanos are also better wooded than the eastern, where trees grow only in clumps, and agaves and cactus make their appearance in the drier parts.

ANON.—*Scottish Geographical Magazine*, April 1896.

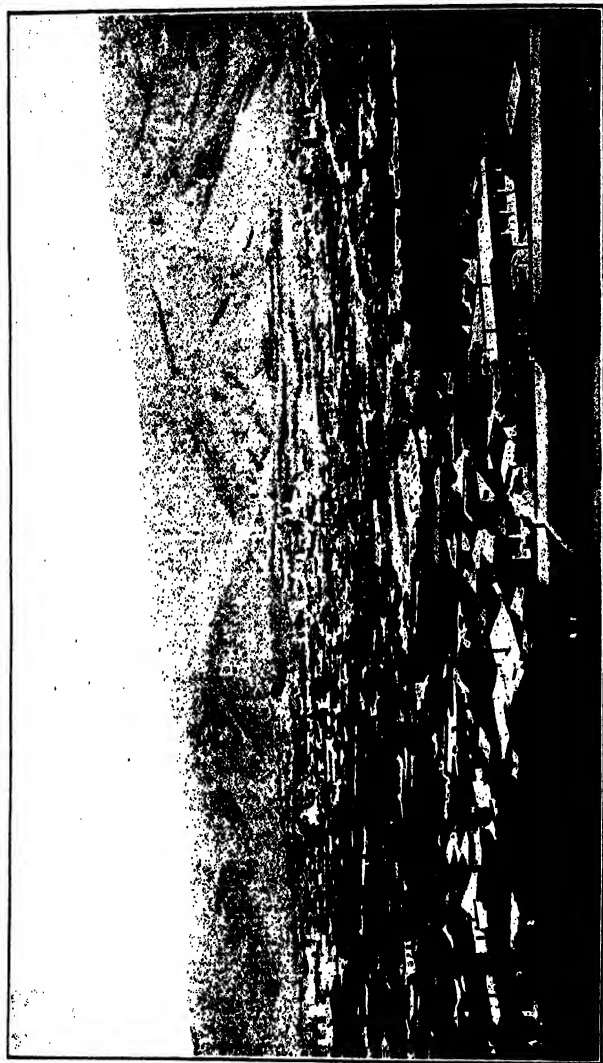
By permission of the Royal Scottish Geographical Society.

La Guayra and Caracas

The chief seaport of Venezuela, La Guayra by name, has the reputation among sailors of having the worst harbour in the world. It is merely an open roadstead, beset by almost all the dangers and difficulties which seamanship can encounter. Even in calm weather the surf rolls up with a mighty volume and dashes into spray against the rocks upon which the town is built; but when a breeze is blowing—and one comes almost every afternoon—the waves are so high that loading or unloading vessels is dangerous and often impossible.

Between La Guayra and Caracas is a mountain called La Silla, which reaches nearly 9000 feet towards the sky, and springs directly from the sea. There is only a beach about 200 feet in width at the foot of the peaks, along which La Guayra is stretched 2 miles or so—a single street. Part of the town clings to the side of the monster, like a creeper to the side of a tree, and one wonders that the earthquakes, which are so common there, do not shake the houses off into the ocean. The distance in a straight line through the base of the mountain would be only about 4 miles, and a Washington engineer once made plans for a tunnel and a cable railway, but it was too expensive an undertaking.

There is nothing Indian about Caracas except its name, and it is one of the finest cities in South America. The climate is superb, being a perpetual spring, the thermometer



CARACAS AS SEEN FROM LA GUAYRA.

seldom rising above 85° and seldom falling below 60° ; there is not a stove, nor a fireplace, nor a chimney in the town; there is no glass in the windows; the nights are always cool, and in the daytime there is a difference of 10 or 12 degrees in temperature between the shady and the sunny sides of the street.

W. E. CURTIS.—*National Geographic Magazine*, February 1896.

By permission of the National Geographic Society.

View of La Guayra and Caracas

Going along the neck of the pass, 7500 feet above the sea, we arrived at the spot which we had come so far to see. On either side La Guayra or Caracas, as the case might be, visible at once in the two valleys—one 3000 the other 7500 feet below our feet. It was an extraordinary, but I can scarcely call it a beautiful view. Its extent was very great, embracing many hundreds of miles of country, stretching far away into Venezuela; but the landscape was far too barren to be really picturesque. Surrounded by extensive plantations of sugar-cane, which made a bright oasis in the dry and thirsty plain, Caracas looked the very type of a South American town, laid out in square blocks, with streets, all running at right angles, of low, one-storied, white, stone-walled, red-roofed houses, exactly the colour of the surrounding earth and mountains. An occasional church or public building rose above the otherwise totally flat surface of the capital of Venezuela. Everybody we have hitherto met since landing here talks of it with the greatest enthusiasm as the most beautiful city in South America.

The railway from Caracas to La Guayra is a wonderful piece of work—a real triumph of engineering skill over the difficulties of Nature. I believe there is only one other like it, and that is somewhere in the Himalayas. Its great peculiarity is its very narrow gauge of 3 feet.

In other respects it much resembles the Oroya¹ line in Peru, which rises 15,640 feet into the Andes (or about the same elevation as the summit of Mont Blanc), and the line in Mexico from Vera Cruz.²

The distance from La Guayra to Caracas as the crow flies cannot be more than 5 or 6 miles; but the line is 23 miles long, which fact will afford some idea of the turns and twists which it has to make. The scenery is superb. The curves of the line are so sharp that, as we stood at the end, the engine looked as though it belonged to another train which was coming in the opposite direction and was about to run into us. It was a wonderful journey, through splendid mountain gorges, with valleys opening out from them at every turn. Sometimes the line scarcely seemed to run on terra firma at all, the rails being laid on wooden brattice-work, firmly secured against the side of the mountain with supports below like a sort of half-bridge, over what appeared to be a fathomless abyss.

LADY BRANSEY.—*In the Trades, the Tropics, and the Roaring Forties.* Longmans.

By permission of Lord Brassey and Messrs. Longmans.

¹ For the Oroya line see Conway, *Climbing in the Bolivian Andes*, pp. 44-47. Harper.

² For the Vera Cruz line see *Descriptive Geography North America*, p. 219.

Vegetation of Caracas

Our upward path was a steep rough staircase, the vegetation on either side of which chiefly consisted of mimosas and acacias of various kinds, some with little white tassels, some with long white and yellow spikes of flowers, all more or less like the familiar bottle-brush of the English greenhouse. There were also magnificent banks of aloes, in every stage of maturity, varying from an inch high to

splendid plants with tall stems of yellow flowers, so regularly shaped as to look almost like giant candelabra. The enormous cacti formed another striking feature in the landscape. Ten, twenty, thirty, and even forty feet high they reared their straight, angular, hairy stems, from which grew scarlet, white, and yellow flowers, and branches which looked exactly as if they had been strangled by a piece of string tied too tightly round them. Ipecacuanha, covered with bright red and yellow flowers, grew in profusion; and bushes covered with apricot blossoms, trees made gay with bunches of yellow cassia (from the leaves of which senna is made), blue, red, purple, and white convolvuli, and other plants of sorts unknown to us, grew and trailed and crept everywhere.

As we mounted to a height of 2000 or 3000 feet, the change in the quality of the air was inexpressibly delicious, especially after the species of hot steam bath we had been living in for the last few days, under the rays of the burning sun. The path to Caracas fortunately lies all along the shady side of the mountain; and this made the ride delightful, especially at so early an hour in the morning, when every leaf and blade of grass was still dripping and glittering with the heavy night-dew, and emitting delicious fragrance, as our mules, pushing their way through the bushes on each side of the narrow and evidently very little frequented path, trampled them underfoot. Our progress was sometimes rather hazardous; for the edge of the perpendicular precipice on one side, from 1000 to 2000 feet deep, was completely concealed by the abundant vegetation, which the mules occasionally stopped to eat. More than once I was startled at finding my mule suddenly crane his head over to get at the top-shoots of some shrub growing just below the path, in the fissure of a precipice, garlanded with lianas, ipomæas, allamandas, hibiscus, begonias, and all manner of flowers and creeping ferns, orchids, and parasites. One could not think much about the danger, however, for the beauty of the scene and foliage increased at every step; and I simply

let the reins lie on my mule's neck, and gazed around with wonder and admiration at the tangled mass of luxuriant verdure beneath our feet, above our heads, and on every side, as we wound our way upwards. This tropical forest was more beautiful than any others I had seen; for the reason that, growing on the side of the mountain, the wood was not quite so dense and impenetrable as is oftentimes the case. It was even possible now and again to see through the forest, and catch glimpses of the plain lying at our feet,—the blue sea sparkling in the sunshine beyond, and the mountains in the distance.

LADY BRASSEY.—*In the Trades, the Tropics, and the Roaring Forties.* Longmans.

By permission of Lord Brassey and Messrs. Longmans.

The Orinoco

On approaching the granitic shores of Guiana, the traveller sees before him the wide mouth of a mighty river, which gushes forth like a shoreless sea, flooding the ocean round with fresh water. The green waves of the river, which assume a milky-white hue as they foam over the shoal, contrast with the indigo-blue of the sea, which marks the waters of the river in sharp outlines.

The appearance of the region first convinced the bold navigator Columbus of the existence of a continent. "Such an enormous body of fresh water," concluded this acute observer of Nature, "could only be collected from a river having a long course; the land, therefore, which supplied it must be a continent, not an island."

The Orinoco is one of those remarkable rivers which after numerous windings, first towards the west and then to the north, finally returns towards the east in such a manner as to bring both its estuary and its source into nearly the same meridian. As far as the Gnaviare, the course of the Orinoco inclines westwards, as if it would pour its waters into the Pacific. Here branches off to

the south the Cassiquiare, which unites with the Rio Negro—a bifurcation which forms in the very interior of the continent a natural connection between two great river valleys.

As far as the mouth of the Guaviare the Orinoco flows along the southern declivity of the chain of the Parima. From its left bank, across the equator and as far as the parallel of 15° S. lat., extends the boundless wooded plain of the Amazon. At San Fernando de Atapabo the Orinoco, turning off abruptly in a northerly direction, intersects a portion of the mountain chain itself. Here are the great waterfalls of Atures and Maypures, and here the bed of the river is everywhere contracted by colossal masses of rocks, which give it the appearance of being divided by natural dams into separate reservoirs.

At the entrance of the Meta stands, in the midst of an enormous whirlpool, an isolated rock, which the natives very aptly term the "Rock of Patience," because when the waters are low it sometimes retards for two whole days the ascent of the navigator. Here the Orinoco, biting deep into its shores, forms picturesque rocky bays.

Opposite Carichana the traveller is surprised by a most remarkable prospect. Involuntarily his eye is arrested by a steep granite rock, which rises precipitously to a height of more than 200 feet, and whose summit is crowned with a luxuriant forest. Like a cyclopic monument of simple grandeur, this bold promontory towers high above the tops of the surrounding palms, cutting the deep azure of the sky with its strongly marked outlines, and lifting, as it were, forest on forest.

On descending beyond Carichana the traveller arrives at a point where the river has opened itself a passage through the narrow pass of Baraguan. Here we everywhere recognise traces of chaotic devastation. To the north rise granitic rocks of grotesque appearance, which, in singularly formed crags of dazzling whiteness, gleam brightly from among the surrounding groves. •

At this point, near the mouth of the Apure, the river leaves the granitic chain, and, flowing eastward, separates as far as the Atlantic the impenetrable forests of Guiana from the savanas, on whose far distant horizon the vault of heaven seems to rest. Thus the Orinoco surrounds on the south, west, and north the high mountain chain of the Parima. No cliffs or rapids obstruct the course of the river from Carichana to its mouth, except indeed the Hell's Mouth (*Boca del Inferno*), near Muitaco, a whirlpool occasioned by rocks, as at Atures and Maypures, which does not, however, block up the whole breadth of the stream. In this district, which is contiguous to the sea, the only dangers to encounter by the boatmen arise from the natural timber-floats. These floats consist of forest trees which have been uprooted and torn away from the banks by the rising of the waters. They are covered, like meadows, with blooming water-plants.

The cataracts of Maypures are a countless number of small cascades, succeeding each other like steps. The *raudal*, as the Spaniards term this kind of cataract, is formed by an archipelago of islands and rocks, which so contract the bed of the river that its natural width of more than 8500 feet is often reduced to a channel scarcely navigable to the extent of 20 feet. It was with surprise I found that the entire fall of the raudal scarcely amounted to more than 30 or 32 feet.

The beholder enjoys a most striking and wonderful prospect. A foaming surface, several miles in length, intersected with iron-black masses of rock projecting like battlemented ruins from the waters, is seen at one view. Every islet and every rock is adorned with luxuriant forest trees. A perpetual mist hovers over the watery mirror, and the summits of the lofty palms pierce through the clouds of vapoury spray.

The raudal of Atures is exactly similar to that of Maypures, which, like it, consists of a cluster of islands between which the river forces itself a passage extending from 18,000 to 24,000 feet. Here, too, a forest of palm

trees rises from the midst of the foaming surface of the waters.

HUMBOLDT.—*Aspects of Nature.* Bell.

Savanas and Forests of the Orinoco

The track from Caicara to Lajitas leads across the wide savana belt that forms the basin of the Orinoco. This undulating savana, constantly broken by out-crops of water-worn ironstone rock, frequently piled into hillocks 300 feet high, is covered with a luxuriant pasturage, chiefly of rich guinea grass, on which numerous cattle of an excellent quality are reared, and is thickly studded with bushes of sweet-smelling chaparral, while in the marshier places long lines of waving moriche palms stand like bonneted sentries across the plain. The rocky *morros* or hills are overgrown by innumerable creepers, flowering shrubs, and forest trees, amongst them the sarrapia, from which the tonca bean is collected, and which gives to these hills their local name of *sarrapiules*.

Naturally grass fires are common in this savana land, and it is curious to see, during the progress of one, the crowds of long-tailed scissor birds hovering round the edge of the flame and eagerly swallowing the smoke-stupefied insects, while on every bush or tree sits some member of the eagle or falcon tribe, intently watching for the frightened rush of some escaping small quadruped.

At Lajitas the *personnel* of the expedition was completed. After the usual difficulties, caused by the unreadiness of our Venezulean followers, we started in a large *curiara* or dug-out canoe up the Cuchivero River, here a swift-flowing stream about 200 yards in width, with high, rotten mud-banks on either side, flanked by a wide belt of well-nigh impassable forest. Every few miles we came to a rapid, or *raudal*, and though all of these, with the exception of the raudal Seriapo, can be shot coming down-stream, we were forced to make a portage over them

on the upward journey ; hence progress was slow, and it was four days ere we reached the Cano Quebradaonda, where we took to the mountains in order to explore a lake called Laguna de la Vaca, of which our followers told many wonderful tales. We had now left the savanas far behind, and were well in the heart of the Cerro Cuchivero, a continuation of the great range of Sierra Guamapi.

The march to the laguna was our first real experience of South American mountain-forest travelling, and very trying it was. Over the curiously piled rocks is spread a carpeting of trailing plants that entirely conceals the treacherous holes and crannies between them, so we were soon severely bruised by constant falls, and scratched and riddled with the spikes and spines with which every plant in the country seems to be abundantly provided. Overhead the sky was hidden by the dense foliage of tall forest trees, so laced together by lianas and other creepers that only by the constant use of the ubiquitous machete could we force a foot of way.

Not a breath of air stirred in this forest land, and the closeness of the atmosphere became at times almost unbearable ; and great was the relief when, after three days' hard work, we emerged on the marshy banks of the laguna. Beyond that it is undoubtedly very deep and blocks a pass 2000 feet above sea-level, between the mountains of La Vaca and La Tor, whose precipitous sides of red rock rise straight from the water's edge on either hand. We saw nothing remarkable about this laguna, which is not more than half a mile in length by a quarter of a mile in width, and is venerated by the Indians as the abode of a curiously malignant spirit.

Another day's cutting brought us back to the river in a fairly famished condition, as our small stock of provisions had given out on the morning of the third day, and as no game could be found we had done two days' work on empty stomachs. On the river we soon found the canoe, which had been sent on in charge of four men, and con-

tinued our southward journey to the raudal Alto, beyond which point navigation is impossible, the Cuchivero here becoming simply a mountain torrent.

From the Alto, which, by aneroid and hypsometric barometer readings, I made about 1900 feet above sea-level, we again faced the terrible mountain work, keeping along the ridges as much as possible to avoid the almost impassable cañons and ravines near the water's edge. The trees here were much smaller than in the lower ranges, but the undergrowth was if anything even more dense, except when we suddenly merged on an open slope of bare rock. On such occasions the view was magnificent—mountain upon mountain rising before us in increasing height and decreasing gradation of colouring, till the background was blocked by the lofty blue peaks of the Sierra Guamapi and the towering summit of great Icutu. This extraordinary mountain, as yet unvisited, and probably unseen, by any other white man (nowhere can I find an account of it), is, according to my calculation, just 11,000 feet high, the base being about 2500 feet above sea-level. The sides slope steeply upward for 8000 feet, when they suddenly bulge outwards, giving the top the appearance of a gigantic button mushroom. The Taparitos, who consider this mountain sacred, say that no man can ascend it; consequently the Great Spirit lives there undisturbed.

The difficulties of this march along the mountains were enormous, an actual advance of 4 or 5 miles forming a good day's work, as frequently, after cutting for hours towards some particular pass or bare spot, we found the way barred by a precipitous ravine or cañon, which took hours again to cut round.

This part of Venezuela teems with insects, especially of those kinds most disturbing to the peace of man. Mosquitoes, sand-flies, and a small stinging beetle, make life a burden to the new-comer, who, try as he may, can find no effective means of eluding them. Every step in the unburnt savana covers one with grass-ticks, and an

occasional tender tickling about the toes suggests that a friendly jigger has ensconced himself comfortably beneath one's skin, only to be ejected by ultimate unpleasant carving.

MAJOR S. PATERSON.—*Geographical Journal*, January 1899.

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British Guiana

Guiana occupies the shoulder of the South American continent, just at the termination of the long chain of West Indian Islands, which reaches from Florida down to the mouth of the great river Orinoco. British Guiana, the area of which is estimated at about 110,000 square miles, is that part which extends from the mouth of the Orinoco and Venezuela on the north to the Corentyn river and Dutch Guiana on the south. It stretches from the first to nearly the ninth degree north of the equator. Its coast region, which consists mainly of a series of river deltas, is almost everywhere very low—indeed almost invariably below the level of the sea. It is everywhere, except where the hand of man has worked a change, covered by a dense growth of trees, of which so large a proportion are the semi-aquatic, stilt-raised mangroves, or the somewhat similar courida, that it requires a careful eye to distinguish the presence of any other species amid the scenery to which these two trees give a very distinctive character. From this low-lying mangrove belt, which may be said to be yet only half land, half sea, there is a gradual, at first scarcely perceptible, rise; but, further inland, the alluvial tract ending at varying distance from the sea, the land rises far more rapidly, in a series of terraces, till it culminates in the comparatively high, dry table-land which, in Guiana, is called savana, and which forms so much of the interior of the continent of South America. In the southern part of the colony this highest line is represented by the Pacaraima, or Parima

range, an outlying spur of which is the renowned Roraima. Yet further south are the Kanaku Mountains, these two being practically the only elevations—any part of which is included within the colony—deserving the name of mountains, though almost all existing maps show many others—mere hills exaggerated by the draughtsman into mountains. But in the north of the colony this highest line is only represented by the lower slopes of the Sierra Imataka range. The limits of British Guiana toward the interior of the continent may roughly be described as corresponding with this line of high land, which naturally also bounds the drainage area of the many considerable rivers of British Guiana. As these mountains themselves are for the most part bare of forest, so also, near their sources, are the banks of the rivers which spring from them. But gradually, along the downward courses of these latter, the trees begin to gather, at first scattered here and there along the banks, then forming a thin line along the water's edge, and, lower down, broadening into a forest belt with the ever-increasing width of the streams. At last, in some cases a couple of hundred miles from the sea, the tree fringe of one river merges with the tree fringe of the next, and thus is formed one dense and unbroken forest, which covers with its almost impenetrable tangle the whole of the lower land, and finally passes, almost without interruption, though with some slight changes in character, into the half-submerged fringe of mangroves which rise on stilted roots from the sea.

E. F. IM THURN.—*Proceedings of the Royal Geographical Society*, October 1892.

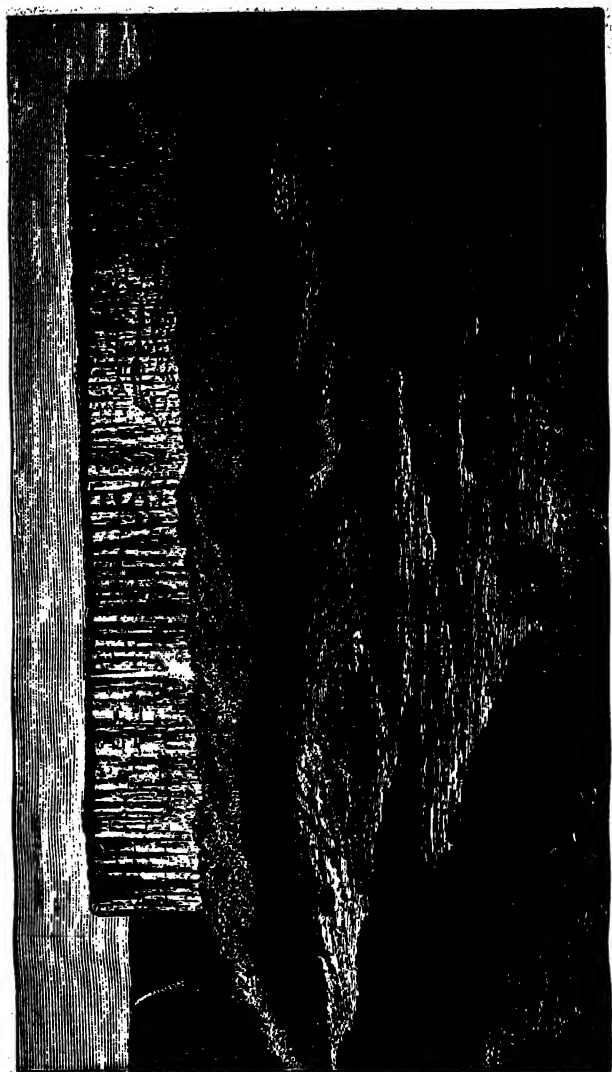
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Roraima

At the foot of the mountain the hilly ground lay in patches of yellow, stony savana and dark strips of wood-

land, rising in elevation as they approached its base. Then came a deep forest-clad ravine, whose farther side sloped steeply up to a distance of about 3000 feet, and springing directly out of this sea of green rose a perpendicular wall of red rock 1500 feet in height. Hardly a shrub broke the sheer descent of the shining cliff; scarcely a hue of verdure marked where clinging grasses had gained a footing on its smooth face. The south-eastern corner was slightly rounded, and its tower-like appearance increased its general resemblance to a Titanic fortification, a few miles in length, rising from a forest glacié. The level summit line was backed by forest trees which to us appeared like bushes, and from their feet, like skeins of floss-silk swaying in the wind, three waterfalls descended and were lost in the woods below. But towards the northern end of the mountain a magnificent cascade, whose lip seemed to be below the summit, sprang in a broad silvery arch right down into the green depths, barely touching the rocky wall in its descent. This is the source of the Cotinga River. Eventually this river falls into the Amazon, after mingling with the Rio Branco and Rio Negro. Still farther north was another fall, whose waters formed one of the principal tributaries of the Cako River, a tributary of the Essequibo.

To the north-east of the mountain, and close to it, was a miniature Roraima, and towards its south-western extremity was another mural precipice, apparently just as impregnable. The mountain was Kukenam, and from our position it seemed to be part of Roraima, but we afterwards found that they were separated by a wide and woody valley. From this mountain too a splendid waterfall makes a clear leap of 1500 feet before it disappears in the green wilderness at its base. It issues from the forest as the Kukenam River, and after joining the Yuruari, which also rises in the Kukenam Mountain, forms the Caroni River, which flows into the Orinoco below Ciudad Bolívar. Thus this extraordinary group of mountains becomes the watershed of some of the



BORAINA.

tributaries of three great rivers, the Amazon, the Orinoco, and the Essiquebo.

J. W. BODDAM-WHETHAM. — *Roraima and British Guiana*.
Hurst and Blackett.

By permission of Messrs. Hurst and Blackett.

Vegetation of British Guiana

Few countries on the surface of the globe can be compared with Guiana for vigour and luxuriance of vegetation. A constant summer prevails, and the fertility of the soil, the humid climate, and congenial temperature, ensure a succession of flowers and fruits; in a person accustomed to the sleep of Nature in the northern regions, where vegetation is deprived of its greatest charms, the leafy crown and the fragrant blossoms cannot but raise astonishment and admiration. Diversified with hills, plains, forests, and meadows, a country so extensive offers various productions. The coasts, washed by the waves of the Atlantic Ocean, are covered with mangrove and courida bushes, and present a verdure of perpetual freshness, forming as it were a seam or fringe to the rich carpet behind. They are enlivened by numerous flocks of the scarlet ibis, the white egret, and the splendid flamingo, which, disturbed at the approach of an intruder, soar into the air or perch on the summits of the trees. Where cultivation has not stamped its seal on the landscape, the marshy plain changes to savana, resembling the meadows of Europe, watered by rivers and limpid streams, interspersed by groups of palms or tufts of trees. On ascending the great rivers, which have been happily called "the veins of the country," we find them covered with verdant isles; and as we approach the primitive forests the landscape assumes the features peculiar to the tropics. Gigantic trees raise their lofty crowns to a height unknown to the European forest. Lianas cling to their trunks, interlace their wide-spreading branches, and,

having reached their summit, their aerial roots descend again towards the ground and appear like the cordage of a ship. Clusters of palm trees, of all the vegetable forms the most grand and beautiful, rise majestically above the surrounding vegetation, waving their pinion-like leaves in the soft breeze. Nature, as if not satisfied with the soil allotted to her, decorates with profuse vegetation the trunks and limbs of trees, the stones, and rocks; even the surface of the water is covered with a thick carpet of plants interspersed by magnificent flowers. What could better give an idea of the luxuriance and richness of vegetation in Guiana than the splendid *Victoria regia*, the most beautiful specimen of the flora of the western hemisphere? The dense and almost impenetrable forest of the interior offers inexhaustible treasures not only for architecture in all its branches, but likewise for the manufacture of furniture, and for many other purposes that minister to the restoration of health or to the comfort and luxury of man. Not less productive in medicinal herbs are the savanas; and an enumeration of the various and useful trees and herbs would fill sheets.

SIR R. H. SCHOMBURGK.—*British Guiana.*

The Victoria Regia

A gigantic leaf, from 5 to 6 feet in diameter, salver-shaped, with a broad rim of light green above and a vivid crimson below, rested upon the water; quite in character with the wonderful leaf was the luxuriant flower, nearly 4 feet in circumference, and consisting of many hundred petals, passing in alternate tints from pure white to rose and pink. The smooth water was covered with them, and I rowed from one to another of them, constantly finding something new to admire. When the flower first opens in the morning it is white, with pink in the middle, which spreads over the whole flower as the sun proceeds towards the western horizon, and is generally found the next day

of a pink colour. As if to enhance its beauty, it is sweet-scented.

SIR R. H. SCHOMBURGK.—*British Guiana.*

The Sugar-cane

Sugar! It is impossible to pass away from this without a further reference. The smoking chimneys, the imposing buildings, the acres of sugar-cane stretching away as far as the eye can reach, are all in evidence.

The sugar-cane has not hitherto been reproduced from seed. Propagation is effected exclusively by cuttings from the stems. Every part of the cane stem having a perfect eye or bud will put forth a new plant. The soundest canes must always be chosen for this purpose. They must be planted in even rows or lines at about 3 feet distance from each other, and the utmost care and vigilance are necessary in weeding and trashing, the last term meaning the removal of dead leaves. Plenty of light and air is necessary. Canes are cut, and the stole or stool is left in the ground, and when this is the case another growth of canes, called ratoons, to distinguish it from the plant canes, comes up. Like all plants, the cane is subject to certain diseases and enemies. Rats are a great plague, but the useful little animal the mongoose has been introduced from India to extirpate them. Another enemy is the ant.

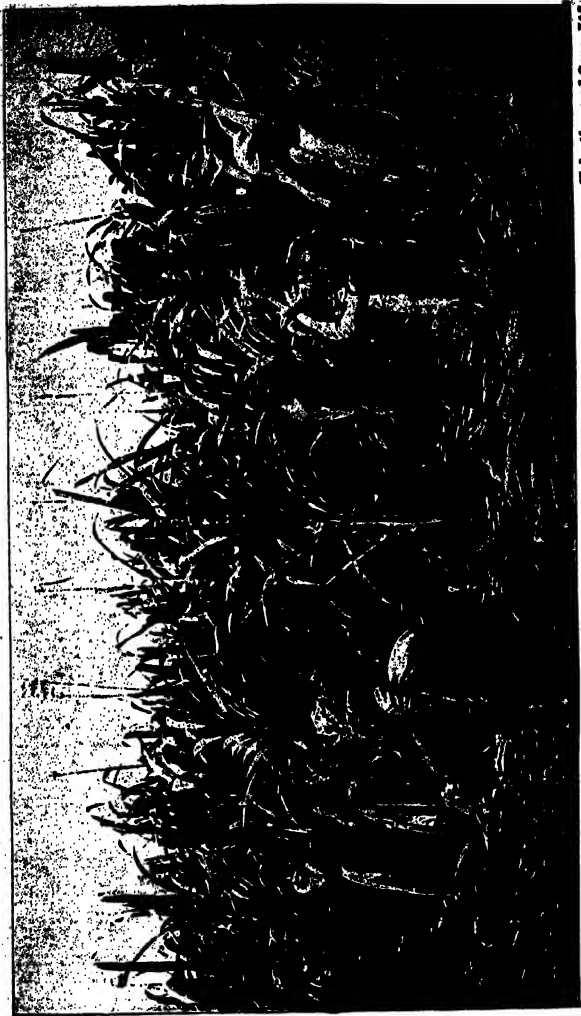
With regard to the yield of an acre, it varies much. In Demerara an average of $2\frac{1}{2}$ to 3 tons of sugar may be expected from an acre of canes. Upon estates particularly well situated the yield is still greater.

C. W. EVES.—*The West Indies.* Sampson Low.

For a description of the extraction of sugar see *ibid.* pp. 139-50.

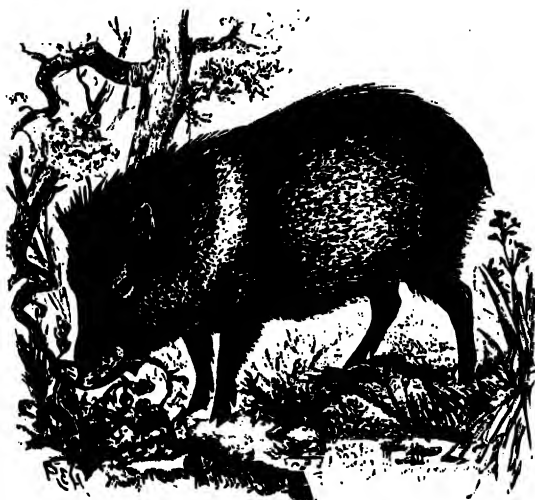
By permission of Messrs. Sampson Low.

SUGAR-CANE CULTURE.



Animal Life of British Guiana

The Western Hemisphere does not equal in number nor size the quadrupeds of Asia and Africa. The jaguar, or South American tiger, the puma or American lion, and several others of the cat species, are the most ferocious; nevertheless, there are but few instances known where they have attacked man, and they are only feared as



depredators on the flocks of cattle and sheep of the colonists. I shall content myself with enumerating such as contribute to the wants of man, affording a wholesome and delicate food. To this belong the tapir or maipuri, the labba, the angi, the acuchi, the cairuni or wild hog, the peccary or Mexican hog, and deer of different species; other animals are the ant-eaters, armadillo, sloth, otters, several species of polecats and opossums. Numerous

herds and varieties of monkeys people the otherwise solitary forest, and serve as food to the natives. The manati, lamantine, or sea-cow is from time to time met with in the larger rivers; its flesh is white and delicate, and has been compared in taste to veal. Not less numerous are the birds; and while some astonish us by their magnificent plumage, others fully make up for their deficiency in this respect by their delicate and nutritious flesh. To the latter belong divers species of wild ducks, the powis,



ARMADILLO.

the marudi, the hannaqua (resembling a pheasant), the duraqua and maam (both resembling the European partridge), wild pigeons, etc. Among divers others I have yet to mention the jabiru or tararamu, a large bird which frequents the savanas, and the flesh of which is not unlike beef in taste; parrots, macaws, the plumage of which glows with the most vivid tints of blue, purple, and yellow; the numerous species of humming-birds, covered with the most gorgeous plumage, and glittering with metallic lustre when winging their way from flower to

flower; the toucan; the bright yellow and black mocking-birds, which construct their pendent nests on the same branch with the wild bees or the wasps, with which it appears that they have entered into an alliance and receive their protection. The most courageous of the monkeys or the wariest of the cats would not attempt a depredation on their eggs as long as under the protection of these insects. The bell-bird or campanero, white as snow, with a leathery excrescence on its head, the cry of which has been resembled to the tolling of a convent bell; the magnificent cock-of-the-rock, with its bright orange plumage and its head surmounted by a semi-circular erect crest,—convey an idea of the splendour with which nature has decked its offspring under the tropics. Of the saurian tribe the caiman and alligator are perhaps the most formidable. The latter is too small to become dangerous; frequently, however, as I have met with the former, I never observed any disposition in them to attack us, unless we had provoked them. The alligator inhabits the coast regions; the caiman is only found in the interior. The iguana, which has the appearance of an overgrown lizard, is from 4 to 6 feet long, including the tail; it is entirely harmless, and its flesh is declared very delicate by every one who has overcome the prejudice which its appearance generally creates. Land tortoises and fresh-water turtles are very abundant, the latter chiefly in the river Essequibo and its tributaries. They assemble in large numbers during the time that the female deposits her eggs on the sandy shore or banks of the rivers. The eggs are very delicate, and are eaten fresh and smoked by the Indians; or they prepare a sweet-tasted oil of it, which is much used for culinary purposes by the Brazilians. Several of the serpents of Guiana are poisonous; but, as if in some measure to guard against their formidable quality, nature has rendered them less dangerous by making them sluggish and loath to bite, unless irritated. The rivers of the interior teem with delicious fish in great variety. The arapaima or pirarucu (*Sudis gigas*) and a

species of *Silurus*, the lau-lau, are from 10 to 12 feet long, and weigh from 200 to 300 pounds.

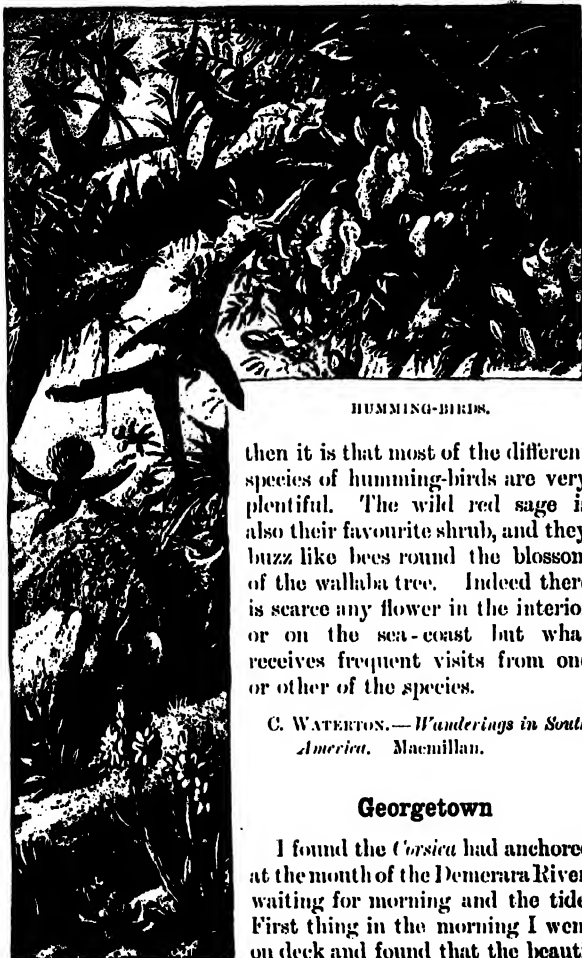
Among insects, some species of ants prove destructive to vegetation ; and the termites, or white ants, are known to have become injurious to the framework of houses or to furniture, if they are allowed to take up their residence in a dwelling. The sting of the scorpion and the bite of the centipede are painful, but not dangerous. The bite of the bush-spider, and what is here called the tarantula, produces inflammation of the part where the bite has been inflicted, but has never endangered life. The chigo (the jigger), a small species of a flea which penetrates into the skin of the feet, proves frequently very troublesome ; it infests abandoned huts, chiefly where there is a sandy soil ; cleanliness in a great measure banishes it. Mosquitoes are not frequent in the interior ; but some regions are infested by a small fly which proves troublesome by its bites.

SIR ROBERT H. SCHOMBURGK.-- *British Guiana.*

The Humming-Bird

Though least in size, the glittering mantle of the humming-bird entitles it to the first place in the list of the birds of the New World. It may truly be called the "Bird of Paradise"; and had it existed in the Old World it would have claimed the title instead of the bird which has now the honour to bear it. See it darting through the air almost as quick as thought. Now it is within a yard of your face ; in an instant it is gone ; now it flutters from flower to flower to sip the silver dew. It is now a ruby, now a topaz, now an emerald, now of burnished gold.

Perhaps you would wish to know something of their haunts. In the months of July and August the tree called *bois immortel*, very common in Demerara, bears abundance of red blossom which stays on the tree some weeks ;



HUMMING-BIRDS.

then it is that most of the different species of humming-birds are very plentiful. The wild red sage is also their favourite shrub, and they buzz like bees round the blossom of the wallaba tree. Indeed there is scarce any flower in the interior or on the sea-coast but what receives frequent visits from one or other of the species.

C. WATERTON.—*Wanderings in South America*. Macmillan.

Georgetown

I found the *Corsica* had anchored at the mouth of the Demerara River, waiting for morning and the tide. First thing in the morning I went on deck and found that the beautiful blue of the water had merged

in a pea-soup colour ; while in the far distance lay the shore, looking as flat and uninteresting as can be imagined, with tall chimneys sticking up in all directions, some of them smoking in a way which would not discredit an English factory. About 7 a.m. we once more started, and in about an hour we dropped anchor in the Demerara River, off Georgetown. Since the site of Georgetown is so flat, no good view is gained on approaching it from the river. Nothing is seen but low wooden buildings and warehouses, over which in the distance can be seen the towers of churches and the tops of the higher houses, amongst which tower up tall cabbage and coco-nut palms.

The first impression that Georgetown gives, on exploring, is its resemblance to a large garden, rather than a town. The streets are so wide that the beaten track runs down the middle and leaves a broad grass plot on each side. All the houses are separate, and each stands on its little plot of ground, which is usually filled with flowering trees and shrubs and palms, giving a very pretty effect.

The houses are raised from the ground on pillars, to protect the inhabitants from the damp rising from the marshy soil on which they are built. Before each runs a balcony or gallery. White enters largely into the decoration of the outside of the houses, and forms a pleasing contrast to the green of the abundant foliage.

J. AMPHLETT.—*Under a Tropical Sky.* Sampson Low.

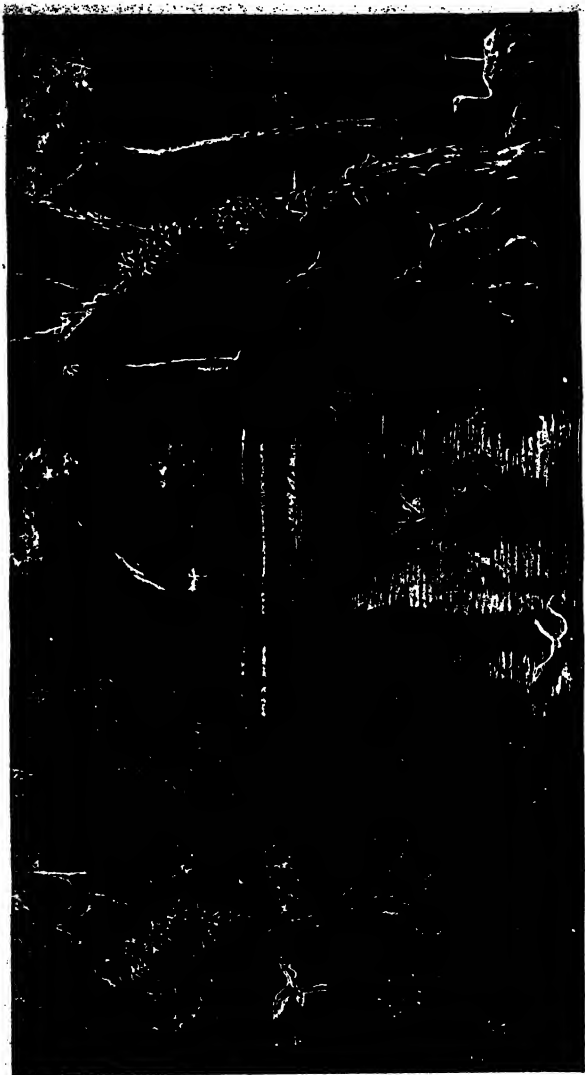
By permission of Messrs. Sampson Low.

V. THE AMAZON BASIN AND BRAZIL

The Amazon

THE main stream of the Amazon is about 4000 miles long—long enough, that is, to go in a circle twice round the British Isles, or 600 miles longer than the voyage from Liverpool to New York. For the lowest 250 miles of its course it is 50 miles wide, or if the island of Marajo in its mouth be regarded as a huge sandbank, which is what it really is, then it is 200 miles wide at its mouth. In other words, one might take the whole of Scotland, push it into the mouth of this river, and leave only a small piece projecting. The Amazon has twenty-nine very large tributaries, each of which is really a gigantic river in itself, and through these tributaries it is connected with the Orinoco and the river Plate. The Amazon rises near the west coast of South America, about 60 miles from Lima in Peru, and runs into the Atlantic, traversing nearly the whole width of the widest part of South America in its course. Its depth in places is 20 fathoms, or 120 feet. It drains an area nearly the size of all Europe, and is the largest body of fresh water in the world. Its average speed of flow is $2\frac{1}{2}$ miles per hour. Hence in going up stream a boat hugs the bank to avoid the current, whilst in descending it sails in mid-stream in order to obtain full advantage of the same. As may be guessed, progress is quicker down stream than up. The influence of its flow can be felt 150 miles from the shore. On one occasion the mess-room steward filled the

THE AMAZON.



filter direct from the sea, when the ship was long out of sight of land, yet the water was only very slightly brackish. The inland navigation of the Amazon and its branches extends over 20,000 miles.

J. JONES.—*Journal of the Manchester Geographical Society*, 1899.

By permission of the Manchester Geographical Society.

The Source of the Amazon

Near the silver mines of Cerro Pasco, in the little Lake of Lauricocha, just below the limit of perpetual winter, rises the "King of Waters." For the first 500 miles it flows northerly, in a continuous series of cataracts and rapids, through a deep valley between the parallel Cordilleras of Peru. Upon reaching the frontier of Ecuador, it turns to the right, and runs easterly 2500 miles across the great equatorial plain of the continent. The breadth of the Amazon, also, is well proportioned to its extraordinary length. At Tabatinga, 2000 miles above its mouth, it is $1\frac{1}{2}$ miles wide; at the entrance of the Madeira, it is 3 miles; below Santarem, it is 10; and if the Para be considered a part of the great river, it fronts the Atlantic 180 miles. Its vast expanse, presenting below Teffe magnificent reaches, with blank horizons, and forming a barrier between different species of animals; its system of back channels, joining the tributaries, and linking a series of lagoons too many ever to be named; its network of navigable waters stretching over one-third of the continent; its oceanic fauna—porpoises and manatis, gulls and frigate-birds—remind the traveller of a great inland sea, with endless ramifications, rather than a river. The side channels through the forest, called by the Indians *igurupé's*, or canoe-paths, are one of the characteristic features of the Amazon. They often run to a great distance parallel to the great river, and intersecting the tributaries, so that one can go from Santarem 1000 miles up the Amazon without once entering it. But extraordinary as is this network of

natural canals, the tributaries of the Amazon are still more wonderful. From 3° N. to 20° S., every river that flows down the eastern slope of the Andes is a contributor—as though all the rivers between Mexico and Mount Hooker united their waters in the Mississippi. While the great river of the northern continent drains an area of 1,200,000 square miles, the Amazon (not including the Tocantins) is spread over a million more, or over a surface equal to two-thirds of all Europe.

J. ORRIS. *The Andes and the Amazon*. Harper and Brothers.

By permission of Messrs. Harper and Brothers.

For the Source of the Huallaga see Cerro de Pasco, p. 190.

The Eastern Andes and the Sources of the Madeira

The snowy range of the Eastern Andes is an unbroken mass, with a high plateau to the westward and the vast plains of the Amazonian basin to the east. It sends up peaks, such as Illimani and Illampu, to a height exceeding 21,000 feet. The limit of perpetual snow is at 15,700 feet, below which there are steep grassy slopes and precipitous declivities, and thence numerous spurs extend for varying distances into the plain, enclosing profound ravines. It is here that the majestic beauty of the Andes is fully realised. Masses of dark mountains rise for thousands of feet, with their bases washed by foaming torrents, and their summits terminating in sharp peaks or serrated ridges. The lower slopes are covered with dense vegetation, the green tints often varied by masses of gorgeous flowers; and, above the forest, the grassy slopes are brightened by the yellow of calceolarias and the rich purple of a melastoma. As the ravines are descended the forest becomes more dense, the open glades disappear, and the delicate pink and white of the cinchona blossoms, set in glossy verdure, begin to dot the hillsides. Everywhere there is flowing water, the condensed moisture of the trade-winds hurrying back to the Atlantic. * Here is

seen a white sheet of continuous foam rushing down the polished side of a precipice and seeming to plunge into a bed of flowers and ferns; there a blue sheet of water appearing to issue from the fleecy clouds that shroud the mountain peaks; everywhere the roar of falling water. As the ravines subside, more extended views are obtained, and at length the vast illimitable plain is seen stretching away in one unbroken forest, the green tints changing to faint blue on the far-off horizon. This has ever been the land of mystery—a land to interest and excite the imagination of generations of explorers.

The two great rivers to which all the thousand streams, pouring down the eastern slopes of the Andes, converge, are the Beni and the Amarumayu, which, uniting with each other after courses of 500 miles each, and then with the Mamore, combine, with the Itinez, to form the great Madeira River. One may be said to come from the vicinity of La Paz, the other from the confines of Cuzco: one the outlet for the commercial capital of Bolivia, the other for the ancient capital of Peru.

SIR C. R. MARKHAM.—*Proceedings Royal Geographical Society*, June 1883.

By permission of Sir Clements Markham and of the Royal Geographical Society.

For a concise account of the Tributaries of the Amazon see H. H. Smith, *Brazil, the Amazons, and the Coast*, chap. xix. Sampson Low.

The Junction of the Madeira and Amazon

Our course on the 29th and 30th lay through narrow channels between islands. On the 31st we passed the last of these, and then beheld to the south a sea-like expanse of water, where the Madeira, the greatest tributary of the Amazon, blends its waters with those of the king of rivers. I was hardly prepared for a junction of waters on so vast a scale as this, now nearly 900 miles from the sea. Whilst travelling week after week along the somewhat monotonous stream, often hemmed in

between islands, and becoming thoroughly familiar with it, my sense of the magnitude of this vast water system had become gradually deadened; but this noble sight renewed the first feelings of wonder. One is inclined, in such places as this, to think the Paraenses do not much exaggerate when they call the Amazon the Mediterranean of South America. Beyond the mouth of the Madeira, the Amazon sweeps down in a majestic reach, to all appearance not a whit less in breadth before, than after, this enormous addition to its waters. The Madeira does not ebb and flow simultaneously with the Amazon; it rises and sinks about two months earlier, so that it was now fuller than the main river. Its current therefore poured forth freely from its mouth, carrying with it a long line of floating trees and patches of grass, which had been torn from its crumbly banks in the lower part of its course. The current, however, did not reach the middle of the main stream, but swept along nearer to the southern shore.

The Madeira is navigable for about 480 miles from its mouth; a series of cataracts and rapids then commences, which extends, with some intervals of quiet waters, about 160 miles, beyond which there is another long stretch of navigable stream.

W. H. BATES,---*Naturalist on the Amazons.* Murray.

By permission of Mr. John Murray.

Vegetation of the Amazon Valley

Perhaps no country in the world contains such an amount of vegetable matter on its surface as the valley of the Amazon. Its entire extent, with the exception of some very small portions, is covered with one dense and lofty primeval forest, the most extensive and unbroken which exists upon the earth. It is the great feature of the country---that which at once stamps it as a unique and peculiar region. It is not here as on the coasts of southern Brazil, or on the shores of the Pacific, where a few days' journey suffices to carry us beyond the forest

district, and into parched plains and rocky serras of the interior. Here we may travel for weeks and months inland, in any direction, and find scarcely an acre of ground unoccupied by trees. It is far up in the interior where the great mass of this mighty forest is found, not on the lower part of the river, near the coast, as is generally supposed. A line from the mouth of the river Parnaíba, in long. $41^{\circ} 30' W.$, drawn due west towards Guayaquil, will cut the boundary of the great forest in long. $78^{\circ} 30'$, and, for the whole distance of about 2600 miles, will have passed through the centre of it, dividing it into nearly two equal portions. For the first thousand miles, or as far as long. $56^{\circ} W.$, the width of the forest from north to south is about 400 miles; it then stretches out both to the north and south, so that in long. $67^{\circ} W.$ it extends from $7^{\circ} N.$, on the banks of the Orinoco, to $18^{\circ} S.$, on the northern slope of the Andes of Bolivia, a distance of more than 1700 miles. From a point about 60 miles south-east of Tabatinga, a circle may be drawn of 1100 miles in diameter, the whole area of which will be a virgin forest. Along the Andes of Quito, from Pasto to Guancabamba, it reaches close up to the eastern base of the mountains, and even ascends their lower slopes. In the moderately elevated country between the Huallaga and Marañon, the forest extends only over the eastern portion, commencing in the neighbourhood of Moyobamba. Further on to the east of Cuzco and La Paz, it spreads high up on the slopes of the Bolivian Andes, and passing a little to the west of Santa Cruz de la Sierra, turns off to the north-east, crossing the Tapajoz and Xingú rivers somewhere about the middle of their course, and the Tocantins not far above its junction with the Araguaya, and then passes over to the river Parnaíba, which it follows to its mouth. The island of Marajo, at the mouth of the Amazon, has its eastern half open plains, while in the western the forest commences. On the north of the Amazon, from its mouth to beyond Montealegre, are open plains; but opposite the mouth of the Tapajoz at

Santarem the forest begins, and appears to extend up to the serras of Carumani, on the Rio Branco, and thence stretches west, to join the wooded country on the eastern side of the Orinoco. West of that river, it commences south of the Vichada, and, crossing over the upper waters of the Guaviare and Uaupes, reaches the Andes of Pasto, where we commenced our survey. The forests of no other part of the world are so extensive and unbroken. In North America alone is there anything approaching to it, where the whole country east of the Mississippi and about the great lakes is, or has been, an almost uninterrupted extent of woodland. In the general survey of the earth we may therefore look upon the New World as pre-eminently the land of forests, contrasting strongly with the Old, where steppes and deserts are the most characteristic features.

There is a grandeur and solemnity in the tropical forest, but little of beauty or brilliancy of colour. The huge buttress trees, the fissured trunks, the extraordinary air roots, the twisted and wrinkled climbers, and the elegant palms, are what strike the attention and fill the mind with admiration and surprise and awe. But all is gloomy and solemn, and one feels a relief on again seeing the blue sky and feeling the scorching rays of the sun. It is on the roadside and on the river's banks that we see all the beauty of the tropical vegetation. There we find a mass of bushes and shrubs and trees of every height, rising over one another, all exposed to the bright light and the fresh air, and putting forth, within reach, their flowers and fruit, which in the forest only grow far up on the topmost branches. Bright flowers and green foliage combine their charms, and climbers with their flowery festoons cover over the bare and decaying stems. Yet, pick out the loveliest spots, where the most gorgeous flowers of the tropics expand their glowing petals, and for every scene of this kind we may find another at home of equal beauty, and with an equal amount of brilliant colour.

DR. A. R. WALLACE.—*Travels on the Amazon.* Ward and Lock.

By permission of Messrs. Ward and Lock. •

Food Produce of the Madeira Basin

Of fish and game the forests and the river yield an abundant supply. Besides turtle in any quantity, alligators are in great numbers. The former is a favourite food of the Indian labourers of Brazil and Eastern Bolivia, who are also not at all averse to a dish of the latter, and I can vouch for the fact that the tail of a young alligator no more than 3 or 4 feet in length is a most excellent dish, being as nearly like filleted sole as can be imagined. When the reptiles grow to a large size the flesh has a very repugnant flavour and smell of musk. Amongst fishes may be mentioned the boto, which has the shape of a large porpoise, but is white-coloured, and has a snout or proboscis about a foot in length. The piexhoi and pirahya are very large, many being 7 and 8 feet in length; they, as well as the boto, are only killed for the oil that can be extracted from their carcasses by boiling. Pirarucus of very large size and weight are found principally in the back-waters or lagoons bordering on the river, and are much sought after for salting down, in which state they form the staple food of the settlers on the Madeira. I have heard that a fair-sized pirarucu will give from 5 to 6 Brazilian *arrobas* (of 33 lbs.) of salted fish; and as I have seen them over 10 feet long and 18 inches to 2 feet in diameter, I can give them credit for yielding such a large quantity of solid food. Pescado, a fish with scales, and to be caught from 1 to 3 feet in length, is the best eating fish in the river, and is quite equal in flavour to fresh cod or bream. The fishermen will often wish heartily that the palometa fish could be exterminated at once and for ever. This fish is flat and small, seldom passing a foot in length, but has a very large mouth for its size, full of the sharpest possible teeth, with which it not only takes the bait from the hook, without danger to itself, but has also been known to take a good-sized piece out of a bather's leg.

The only large animal in the country is the tapir. He

is a very timorous and inoffensive animal, and must be shot at night time, the practice being for the hunstman to set up a raised platform of poles, sometimes placed in the fork of a conveniently situated tree. This platform must command the pool of mud where the tapir comes for his nightly bath and supper of succulent roots; and some



hunters place a candle or small lamp near the pool, the light of which attracts the stupid beast. A moonlight night is, however, the best for the sport, and as soon as the animal shows, the contents of one barrel are generally sufficient to bring down the game. The tapirs are as large as a fair-sized Brazilian bullock, and the flesh is like beef in taste.

E. D. MATHEWS.—*Up the Amazon and Madeira Rivers, through Bolivia and Peru.* Sampson Low.

By permission of Messrs. Sampson Low. •

Economic Possibilities of the Amazon

It is a vulgar error, copied and repeated from one book to another, that in the tropics the luxuriance of the vegetation overpowers the efforts of man. Just the reverse is the case: nature and the climate are nowhere so favourable to the labourer. It is true that ground cleared, in the manner of the country, by merely cutting down the wood and burning it as it lies, will, if left to itself, in a single year be covered with a dense shrubby vegetation; but if the ground is cultivated and roughly weeded, the trunk and stumps will have so rotted in two or three years as to render their complete removal an easy matter, and then a fine crop of grass succeeds; and, with cattle upon it, no more care is required, as no shrubby vegetation again appears. Then, whatever fruit trees are planted will reach a large size in five or six years, and many of them give fruit in two or three. Coffee and cacao both produce abundantly with the minimum of attention; orange and other fruit trees never receive any attention, but if pruned would no doubt yield fruit of a superior quality, in greater quantity. Pine-apples, melons, and water-melons are planted, and when ripe the fruit is gathered, there being no intermediate process whatever. Indian corn and rice are treated nearly in the same manner. Onions, beans, and many other vegetables thrive luxuriantly. The ground is never turned up, and manure never applied; if both were done, it is probable that the labour would be richly repaid. Cattle, sheep, goats, and pigs may be kept to any extent; nobody ever gives them anything to eat, and they always do well. Poultry of all kinds thrive. Molasses may be easily made in any quantity, for cane put into the ground grows, and gives no trouble; and I do not see why the domestic process used in the United States for making maple-sugar should not be applied here. Now I unhesitatingly affirm, that two or three families, containing half-a-dozen working and industrious men and

boys, and being able to bring in a capital in goods of £50, might in three years find themselves in the possession of all I have mentioned. Supposing they get used to the mandioca and Indian-corn bread, they would, with the exception of clothing, have no one necessary or luxury to purchase; they would be abundantly supplied with pork, beef, and mutton, poultry, eggs, butter, milk, and cheese, coffee and cocoa, molasses and sugar, delicious fish, turtles, and turtles' eggs, and a great variety of game would furnish their table with constant variety, while vegetables would not be wanting, and fruits both cultivated and wild, in superfluous abundance, and of a quality that none but the wealth of our land can afford. Oranges and lemons, figs and grapes, melons and water-melons, jack-fruits, custard-apples, pine-apples, cashews, alligator pears, and mammee apples, are some of the commonest, whilst numerous palms and other forest fruits furnish delicious drinks, which everybody soon gets fond of. Both animal and vegetable oils can be procured in abundance for light and cooking. And then having provided for the body, what lovely gardens and shady walks might not be made! How easy to construct a natural orchid-house, beneath a clump of forest trees, and collect the most beautiful species found in the neighbourhood! What elegant avenues of palms might be formed! What lovely climbers abound, to train up the walls of the house! Tobacco, coffee, molasses, cotton, castor-oil, rice, maize, eggs, poultry, salt-meat and fish, all kinds of oils, cheese, and butter, can always be sold,—the supply being invariably below the demand,—and besides providing clothing and other extras, which in this climate are a mere trifle, might be made to produce a handsome profit. To do all this requires some experience and some industry; but not a tithe of either which are necessary to get a bare living at home.

DR. A. R. WALLACE.—*Travels on the Amazon.* Ward and Lock.

By permission of Messrs. Ward and Lock.

An Indian Tribe of the Lower Amazon

On the afternoon of the 9th we arrived at Matari, a miserable little settlement of Mura Indians. The place consisted of about twenty slightly-built mud hovels, and had a most forlorn appearance, notwithstanding the luxuriant forest in its rear. The absence of the usual cultivated trees and plants gave the place a naked and poverty-stricken aspect. I entered one of the hovels, where several women were employed in cooking a meal. Portions of a large fish were roasting over a fire made in the middle of the low chamber, and the entrails were scattered about the floor, on which the women with their children were squatted. These had a timid, distrustful expression of countenance, and their bodies were begrimed with black mud, which is smeared over the skin as a protection against mosquitoes. The children were naked; the women wore petticoats of coarse cloth, ragged round the edges and stained in blotches with murixi, a dye made from the bark of a tree. One of them wore a necklace of monkeys' teeth. There were scarcely any household utensils; the place was bare, with the exception of two dirty grass hammocks hung in the corners. I missed the usual mandioca sheds behind the house, with their surrounding cotton, cacao, coffee, and lemon trees. Before we left the hut an old couple came in; the husband carrying his paddle, bow, arrow, and harpoon—the woman bent beneath the weight of a large basket filled with palm fruits. The gloomy savagery, filth, and poverty of the people made me feel quite melancholy, and I was glad to return to the canoe.

The Muras have a bad reputation over all this part of the Amazon. Yet there is nothing, I think, to show that the Muras had a different origin from the nobler agricultural tribes belonging to the Tupi nation, to some of whom they are close neighbours. They are merely an offshoot from them, a number of segregated hordes

becoming degraded by a residence, most likely of centuries, in *ygapo*¹ lands, confined to a fish diet, and obliged to wander constantly in search of food. Those tribes which are supposed to be more nearly related to the Tupis are distinguished by their settled agricultural habits, their living in well-constructed houses, their practice of many arts, such as the manufacture of painted earthenware, weaving, and so forth. The Muras have become a nation of nomadic fishermen, ignorant of agriculture and all other arts practised by their neighbours. They live in separate families or small hordes, wandering from place to place along the margins of those rivers and lakes which most abound in fish and turtle. At each resting-place they construct temporary huts at the edge of the stream. Their canoes originally were made simply of the thick bark of trees, bound up into a semi-cylindrical shape by means of woody lianas; these are now rarely seen, as most families possess montarias, which they have contrived to steal from the settlers from time to time. Their food is chiefly fish and turtle, which they are very expert in capturing. They shoot fish with bow and arrow, and have no notion of any other method of cooking it than by roasting. As a general rule the only vegetable food is bananas and wild fruits. The original home of this tribe was the banks of the Lower Madeira.

W. H. BATES.—*Naturalist on the Amazon*. Murray.

For *ygapos*, see *ibid.* pp. 150, 322; and Wallace, *Travels on the Amazon*, pp. 120, 121.

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¹ Low-lying and often submerged forest areas.

Rubber Collecting

The localities where rubber trees thrive the best are on islands and low grounds near rivers, where the banks are periodically inundated. Ground that is above water at all times or that has no drainage is not suitable. The

peculiarity of this rubber is that it will not grow satisfactorily on cleared or open ground. It requires the shade of other trees and still air from the time that its growth begins until it becomes an adult tree. Without these conditions the supply of milk is very much affected. In fact, the tree has been known to die soon after the clearing of ground around it.

Among other articles used in the india-rubber industry is a clay funnel, in shape very much like an ordinary toilet water-jug, without a bottom or handle. It is made of the clay that exists in most parts of the Amazon region. The fuel used in the funnel consists generally of the nuts of the cerbain. It was at one time imagined that the excellence of Para rubber was greatly due to the kind of fuel used in curing it. The palms that furnish the fuel were accordingly transplanted to Africa, with a view to making Para rubber there. The experiment, however, has not met with success. The reason these nuts are selected in Brazil is because they emit a continuous dense smoke, and are more portable than other fuel obtainable. However, when none of the palms named are accessible, bark and twigs are used as fuel.

Every one engaged in the forest carries a wood-knife. One of its uses is to cut down fuel for the preparation of rubber. The blade is about 26 inches long, and about 2 inches broad. Owing to the damp climate the blades are electro-plated, thus preventing them becoming rusty before they are marketed. The handles are made of wood, and are carved or inlaid with brass.

The rubber-collector's axe is a very small affair. It is required to chip a smooth surface on the bark preparatory to attaching a cup to the tree. The handling of the axe requires great skill, in order not to injure the bark. A smooth surface is made, in order to prevent impurities from mixing with the sap.

The cups are of clay or tin. The former are attached to the bark by means of a little clay. Their weight, however, makes them inconvenient to carry when the trees to

be tapped are separated by long intervals; the collector then prefers to carry tin cups, which are much lighter than the others. They easily penetrate into the bark by means of their sharp edges, and hold to the tree without the use of clay. The use of the tin cup, however, is to some extent injurious to the tree.

Part of the collector's outfit consists of a light gourd, large enough to carry the contents of from 500 to 700 cups. A clay bowl is next required in order to receive the contents of the gourd. It is of sufficient size to contain the product of several days' work before it is cured. The calabash tree provides calabashes, which are employed to ladle the milk from the clay bowl into the mould. A broad-bladed wooden paddle is used as a mould, and is made locally. This completes the outfit of the rubber-collector. All these articles are made locally, with the exception of the knives. The axes and the tin cups are manufactured in the towns and villages of the Amazon region.

The collector has to use his knife to cut his way through the undergrowth, and also to cut down a sapling, occasionally to bridge a rivulet. At times he is knee-deep in ooze or up to his waist in water. On arrival at a rubber tree, he chips away the rough parts of the bark, makes a more or less smooth surface, attaches a cup, and makes a small gash above for the sap to fall into the cup, and repeats this process in a line around the tree until he has attached six or seven cups. Then he proceeds to the next tree and does the same. He continues the process until he has tapped from 75 to 150 trees, which can be done in a day if they are not too far apart. On the following day the gashes in the trees are made a trifle lower down than the first ones. Some collectors tap the trees in the morning and return to collect the sap in the evening, whereas others tap in the evening and collect in the morning. An expert gathers seven pounds daily in the Lower Amazon; in the Upper Amazon three times this amount is collected.

When the accumulation of rubber is sufficient—usually in three or four days—the collector lights a fire in the hut he has erected, places the funnel over it, pours a thin coat of milk over the paddle, and holds it over the smoke to coagulate. The process is repeated until a large cake has been formed. To release the paddle from the cake it is necessary to make a slit on one side. The paddle mould makes a cake of uniform and even shape, and is in general use in the state of Para.

Consular Report, quoted in *Journal of School Geography*,
January 1900.

Para

After a run of ten days almost directly south-west from Madeira, the low-lying land of the Brazilian coast is approached at Salinas, some distance east of the mouth of the Tocantins River, or eastern mouth of the Amazon, as it is sometimes called. Here a light-ship is stationed, and here also the pilot is always taken on board. The navigation from here to Para becomes somewhat intricate because of the banks, which are formed by the mass of material brought down by the rivers, continually changing position ; indeed the whole of this northern coast, being low-lying and very imperfectly surveyed, necessitates a wide berth being given it by a ship, and without a pilot causes the skipper to have a somewhat anxious time there. Wrecks are far from infrequent.

Steaming west, along and at some distance from the coast for some hours, the Tocantins River-mouth is reached and entered. Soon the land on the east or right side becomes increasingly distinct ; fishing-craft, canoe-shaped, of small and characteristically Portuguese-Brazilian type, appear ; details upon the land show up ; huts, houses, and small settlements, seeming nearly buried in the luxuriant forest growth which already clothes the banks down to the water's edge, dot the shore ; then on the left side the margin of the low-lying and marshy island of Marajo can

be traced, and soon becomes more distinct; then smaller islands, all covered with forest, are passed. On the right bank the houses and settlements become more and more numerous; some of these have wooden piers jutting out into the river, alongside of which steam ferry-boats and small river steam-boats are lying, and landing their human and other freight; these are the watering-places and pleasure resorts of the inhabitants of Para; they announce to us that we are rapidly approaching this important town. After anchoring off one of the islands some 20 miles north of Para, the quarantine station, and receiving the health authorities, we proceed for a time up the Para River, a waterway and a branch of the Tocantins, some 2 or 3 miles broad, bounded on the right by a maze of islands and by the mainland on the other—all luxuriantly wooded.

Para, the capital of the large State of Para, is an important town, situated upon the Para River, about a degree and a half south of the equator, having an estimated fluctuating population of some 80,000 to 100,000. The site, reclaimed from the forest, is a slightly undulating flat, apparently composed entirely of river alluvium. The temperature is equable, and far from excessive when its proximity to the equator is considered, for it ranges between $78^{\circ}0'$ and $90^{\circ}0'$ Fahr., being rarely, I believe, much below the former or much above the latter. This fortunate condition is brought about, for the most part, by the cool sea breezes which blow so frequently from the north-east and east. The houses and buildings are considerable in number, substantial, and well built; some, indeed, of the public erections being handsome and imposing edifices. The common building material is in a large part a peculiar porous, honey-combed brick, the bricks for which are made in the vicinity; the stone and bricks for any buildings which are more substantial have to be imported, largely from Europe—so also are the paving stones for the streets. These—at least many of them—are well paved; some—the older ones—are somewhat narrow, but many of the newer are fine and broad, and also, for the most

part, planted with fine trees—mango and palm principally. There are several small public gardens and fine *plazas* within the town, which are well cared for, while in the suburbs are parks and other pleasure resorts. A fine theatre decorates one, and public monuments others, of these *plazas*. The town is rapidly developing, and the suburbs are being laid out well, and fine residential buildings erected in the principal streets. A good and frequent service of tram-cars facilitates rapid transit from one part of the town to another, but they are small, dirty-looking, and often crowded. Mules are at present entirely used for traction power.

The people are a mixed and heterogeneous lot: whites (principally Portuguese and Brazilians of Portuguese origin, of the darker south European variety), through all shades of yellow and brown, to black. Most of these are half-breeds, crosses between Portuguese and Indian, Indian and Negro, White and Negro, together with mixtures in infinite variety and tenuity of all of these. The hair is also correspondingly various-textured; though universally dark in colour, one sees the lank and straight, the wavy, curly, and all degrees of frizziness, down to the negro's woolly pate. Presumably on account of the predominance among the population of persons with some degree of colour, no disability is caused by colour. The trade of Para, especially its export, is mostly in the hands of foreigners—German, British, and American; these have commodious offices and warehouses there. Its principal, almost sole, export is rubber, and one may say its very existence depends upon this valuable commodity; but nuts, cocoa, and other vegetable products are also exported to some extent. Its imports are general goods, in great part manufactured articles and food, with the consequent result that all necessities are dear there, and living very expensive. Practically no agriculture whatever is practised in this part of Brazil, though a little stock-farming and cocoa-growing is carried on up the river.

Dr. R. KORTLITZ.—*Scottish Geographical Magazine*, January 1901.

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North-east Brazil

From the Amazon River to Cape San Roque, the north-east point of Brazil, we have a dry, low, hot, sandy sea-coast belt, poorly watered and with scanty vegetation; but, penetrating inland, it is diversified by *campos*, alluvial flats, and broken hills. The highland range is Ybiapubao, which bounds Ceara on the west, has a steep and often precipitous front to the east. It is 2000 to 2400 feet above sea-level, and flat-topped for a width of 32 to 56 miles. Its western slope is easier towards Rio Parnaíba. There are occasional forest areas, but generally the country is thinly wooded, and has extensive intermediate areas of porous, sandy soil covered with grass and scrub. Pasture lands are found on the plateaus and sometimes in the river valleys. The whole enormous area east of the Parnaíba, and as far south as 14° of latitude, is subject to terrible and prolonged droughts, resulting in starvation to its population, more especially in the State of Ceara. West of the Parnaíba as far south as the river Tocantins, there are dense forests. From the former stream to the mouth of the Rio São Francisco, the coast is fronted by narrow reefs, mostly coralline, which are usually exposed at low water.

COL. G. E. CHURCH.—*Geographical Journal*, April, 1901.

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Climate of Brazil

Those whose tropical experience has been in the East Indies or the western coast of Asia can have no just conception of the delightful climate of the greater portion of Brazil. Nature has heaped up her bounties of every description: cool breezes, lofty mountains, vast rivers, and plentiful pluvial irrigation, are treasures far surpassing the sparkling gems and the rich minerals which abound within the borders of this extended territory. Whilst in

a large part of Mexico, and also on the west coast of South America, rain has never been known to fall, Brazil is refreshed by copious showers, and is endowed with broad, flowing rivers, cataracts, and sparkling streams.

South America is like a great irregular triangle, whose longest side is upon the Pacific. Of the two sides which lie upon the Atlantic, the longest—extending from Cape Horn to Cape St. Roque—is 3500 miles, and looks out upon the south-east; while the shortest—looking north-eastward—has a length of 2500 miles. This configuration has a powerful effect upon the temperature and irrigation of Brazil. The La Plata and the Amazon result from it, and from those wonderful winds, called the Trades, which blow upon the two Atlantic sides of the great triangle. These winds, which sweep from the north-east and the south-east, come laden, in their journey over the ocean, with humidity and with clouds. They bear their vapoury burdens over the land, distilling, as they fly, refreshing moisture upon the vast forests and the lesser mountains, until, finally caught up by the lofty Andes, in that rarefied and cool atmosphere they are wholly condensed, and descend in the copious rains which perpetually nourish the sources of two of the mightiest rivers of the world.

No other tropic country is so generally elevated as Brazil. Though there are no very lofty mountains except upon its extreme western boundary, yet the whole country has an average elevation of more than 700 feet above the level of the sea. This great elevation and the strong trade-winds combine to produce a climate much cooler and more healthful than the corresponding latitudes of Africa and Southern Asia.

The heat of summer at Rio de Janeiro is never so oppressive as that which I have often experienced in the hot days of July and August at New York and Boston. It must, however, be conceded, that three months of weather varying between 73° and 89° would be intolerable if it were not for the cool sea-breeze on the coast, which generally sets in at 11 A.M., and the delicious land-breeze

which so gently fans the earth until the morning sun has flashed over the mountain. In the interior the nights are always cool.

KIDDER AND FLETCHER.—*Brazil and the Brazilians*. Sampson Low.

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The São Francisco

The first sight of the river was undoubtedly disappointing. A placidly flowing stream, about 1000 feet wide, of dirty water of a weak pea-soup consistence and colour. The banks were high and precipitous, and covered with many deposits of slimy mud; up and down stream they were topped by an uninterrupted belt of forest of large trees, small trees, bushes, hanging festoons of creepers and convolvuli; here and there the waters had undermined the banks, and huge trees had fallen and stretched out their slime-covered skeleton forms, like the bones of some monster. The air was hot and oppressive. There was an all-pervading smell and sensation of slime. The leaves of the lower bushes, the decaying leaves of the floor of the forest, the banks, old logs, and dead tree-trunks, were grey with the deposited mud of past floods. Behind the long slopes of woods were long stretches of marshy grass-lands, here and there containing pools of stagnant water. Further inland the land rises, sometimes in gentle slopes, sometimes in precipitous grass-covered bluffs, to the high table-lands that close in the valley of the river.

The survey had to traverse the dense woods lying between the river-side swamps and the base of the adjoining hill-slopes. These woods are exceptionally unhealthy, for they are alongside the exhalation of the marshes, and within their recesses numerous pools of black, stagnant water, filled with rotten vegetable matter, generate clouds of mosquitoes, and the air smells like that of a close vault—a faint and sickly odour. The vegetation is rank and luxurious; mosses, ferns, parasites, orchids, and lichens cover every trunk and bough and rocky boulder; red-

banded butterflies flutter like two eyes of fire in the sombre gloom; repulsive-looking toads frequent the Stygian pools.

We emerged on to an open grassy plain that extended to the base of the hills of the Serra da Munosa. It is called a serra, but the heights are really the bluffs of the table-lands that enclose the valley of the Rio São Francisco. The ascent was up a steep, stony, boulder-strewn path, through forest and dense thorny bush. After a sharp struggle we reached the summit, from whence appeared a grand panorama of the São Francisco, its valley, and the surrounding country. In the distance could be discerned the bluffs of the table-land on the other side, stretching away to the north and south in a direction parallel to the highlands we were on. Some of those bluffs were obscured in the grey mists of passing thunderstorms, others showed their ravined surfaces even in the far distance, clear and distinct in the rays of the afternoon sun. The altitude above the valley was comparatively insignificant (about 400 feet), but we experienced a considerable change in the atmosphere, from the close humid heat of the lowlands of the river-sides to the fresh cool breezes of the campos lands.

J. W. WELLS.—*3000 Miles through Brazil*. Sampson Low.

By permission of Messrs. Sampson Low.

Minas-Geraes

The province of Minas-Geraes is the most important of all the inland divisions of Brazil, owing to its mineral and vegetal riches, its immense herds, its accessibility to market, and its population. Its climate is mild and healthful; its surface is elevated and undulating; its soil is fertile, and capable of yielding the most valuable productions; its forests abound in choice timber, balsams, drugs, and dye-woods. But all these circumstances together have not given the province so much celebrity.

as the single fact of its inexhaustible mineral wealth. Its name signifies general or universal mines, and accordingly mines of gold, silver, copper, and iron are found within its borders.

The agricultural capacities of the province are very great. It yields coffee, sugar, tobacco, and cotton. Upon its *campinas*, or upland prairies, innumerable herds of cattle and some flocks of sheep are pastured. The great staple, however, of Minas-Geraes and of the whole of Brazil is coffee.

KIDDER AND FLETCHER.—*Brazil and the Brazilians.* Sampson Low.

By permission of Messrs. Sampson Low.

In the Highlands of Brazil

After a long and patient climb we mount a ridge that we have concluded must be the summit, only to see ahead another and a higher one, and so on by a series of stops, as it were, we climb on till we arrive at last at the highest point.

N.E. and S.W. we can trace the course of the serra, a myriad peaks of bare rock, rounded, ridged, flat, pointed and saddle-back hilltops, valleys and chasms and deep ravines, all covered with grass. The summit of the serra is a shallow depression about an acre in extent, covered with a rich soft greensward, with a few beetling crags of dark ironstone, weather-stained, mossy, and spotted with various lichens, rising boldly from the otherwise even surface. Bromelias, cacti, and orchids abounded on the rocks and upon a few stunted trees that grew unaccountably in the red, flaky, metalliferous soil. As we descend the northern slopes, other flowers, somewhat similar to camellias and magnolias, appear amongst groups of bamboos, dwarf trees, and cactus, and yet the soil appeared to be of the most sterile nature.

Soon our attention is required to preserve our necks in making the descent of the serra. For a long way the

road keeps the steep sides of hills—high, grassy, boulder-strewn slopes on one side, and on the other deep cavernous ravines. The road is roughly paved with huge irregular blocks and slabs of stone that must have been collected from the adjoining hills with extraordinary labour and difficulty. A low parapet wall, two to three feet high, provides a welcome defence from slipping down the adjoining precipices. At one bend of the road, comparatively level, we catch a glimpse below us of the Rio Paraofeba in its wooded valley; around us the grass-covered and boulder-strewn buttress hills of the serra, divided by deep ravines and wide or narrow wooded valleys. Above and behind us we can trace up the hill-sides the course of the road we descended. Finally we reach the base of the mountains and travel through a hilly undulating country, towards the river.

J. W. WELLS.—*3000 Miles through Brazil*. Sampson Low.

By permission of Messrs. Sampson Low.

For the Paraguay basin of Central Brazil, see pp. 134-36.

Pernambuco

The view of Pernambuco from the sea is very fine. The houses are lofty and prettily built in the Portuguese style, with channelled tiles and turned-up corners. They are generally whitewashed, but some are tinted. The land is for the most part quite flat, but about two miles from Pernambuco to the north there is a hill, on which stands Olinda, the old town of this harbour. This hill looks very well, dotted with white houses among the dark green foliage, and fringed with coco-nut trees.

Now you must understand how the harbour of Pernambuco is formed, for it is certainly among the wonders of the world, though there is nothing very striking about it in appearance. Parallel to the beach is a narrow reef of rock, which just rises above the top of the water at high water; at low water it is exposed about 6 feet. The reef,



PERNAMBUCO.

which seems to be about 5 or 6 feet across, runs along the coast for some 300 miles, leaving a navigable channel, from a few hundred yards to a mile or so in width, between it and the beach all the way. The harbour of Pernambuco is formed by this acting as the breakwater, and the entrance to the harbour is through an opening in the reef.

The country about Pernambuco is an extensive sandy plain, bounded by a semicircular range of low hills of red clay. The view from the tops of these hills is magnificent in the extreme; it lies stretched out before you like a vast panorama of the brightest green. The hills come down to the sea at Olinda, and on the south. Pernambuco lies on the seaside at the centre of the semicircle. All round the town in its nearer vicinity the plain is cut up into gardens and orchards, each with its country house. On the outer part of the plain near the hills the gardens disappear, giving place to fields of sugar-cane, interspersed with maize and mandioca. The whole nearly of this plain is loose sand, and poor as it looks, it is on this that all the fruit trees and other rich productions of nature are growing. It is obvious that at no very distant time the whole was covered with the sea, and that the beach was along the base of the hills.

C. B. MANSFIELD.—*Brazil, Buenos Ayres, and Paraguay.* Macmillan.

Rio Janeiro

The bay of Rio de Janeiro is unrivalled. It affects the form of a bagpipe, being narrow at the mouth, at one part only 1500 yards wide. The city lies at the south-west corner of the bay, some of the outlying suburbs doubling the corner and facing the Atlantic. After entering the bay, the shore falls rapidly back east and west, until it reaches a breadth of nearly 19 miles. It is bordered on the right by the hills of Nitcheroy, on the left by the Sugar Loaf and Corcovado Mountains, the city of Rio, and the Tijuca mountain range, which circles round behind.

At the head of the bay rises the long jagged ridge of the Organ Mountains.

To attempt to describe the scene from the bay would be futile. Suffice it to say that there is probably no other which like it combines at once the idyllic prettiness of a Nova Cintra, a Botafago, or a Gloria, their white houses and churches set like chiselled milk-stones in a garden of palms; the bold beauty of the sunlit bay studded with a hundred islands and islets; the naked asperities of rocks that do daily battle with wind and wave; the sombre simplicity of age-long forest covering the remoter slopes, which wind into and fold upon one another until the curves are lost in the crowning heights, whose sharp cones and rived ridges speak of a great effort long past, strangely at contrast with the solemn peace which now invests their lonely heights. It is not strange that the semblance of a closed hand, with the index finger pointing to the sky, which may be readily detected in the serrated ridge of the Organ Mountains, should have been called the Finger of God.

The city, as already stated, lies at the south-west corner of the bay, and is built upon and between a number of spurs flung out by the Tijuca range, or detached hills or knots of hills, which lie between the latter and the bay. The number of these eminences, known as *morros*, is thirty-five. The old town, as it is called, is the most populous and least healthy, and forms the chief commercial centre. It is for the most part laid out in a system of long, narrow streets, crossing one another at right angles—streets so narrow that vehicles are permitted to move in them in one direction only. An altogether different atmosphere pervades the opulent quarters to the south of the city, such as Gloria, Catete, Botafago, and other outlying districts, where broad, well-kept thoroughfares are lined by elegant houses, many set in a garden of beautiful tropical plants, or buried in the still richer profusion of the *chacara*, which combines in itself the attributes of garden, park, orchard, and forcing-house.



RIO JANEIRO.

Proceeding southwards from the city, and skirting the Morro de Santa Theresa and the base of the Corcovado, on the right hand, we pass at the same time on the left the bay of Botafago, all but encircled by mountains, which terminate at the southern arm of the bay in the grim old Sugar Loaf. The calm, blue waters of this bay, with its mountain setting, are more suggestive of Alpine heights than of the Atlantic. On the seaward side of the Corcovado, lies the Jardim Botânico. The entrance opens on what is admittedly the finest palm avenue in the world. A second grove, only inferior in extent to the main avenue, crosses the latter at the entrance like the headpiece of the letter T. The principal grove extends about half a mile, and is formed by 150 trees of the Palma Imperial in double file, separated by intervals in 30 feet, and with their grey, straight, regularly-rounded stems practically walling up a pathway 20 feet broad.

As we pass up the avenue, side-avenues open, some formed of a single species of tree. Now it is a grove of mangoes, then one of bamboo. Between these intersecting avenues lie greenswards, dotted with clumps of mixed trees, or solitary specimens of the more lordly sort, broad-leaved bananas, feathery bamboos and tree-ferns, cabbage-coco and fan-palms, and all their lovely sisterhood; the dense cope of the heavy-fruited bread-fruit, and jaca, and mango, whose thick, broad leaves make local darkness in the height of noon. Landward, the garden is mountain-girt; seaward the shadowy avenue opens upon the sunlit waters as on a lighted stage.

J. M. BORASTON.—*Journal of the Manchester Geographical Society*, October 1898.

By permission of the Manchester Geographical Society.

Southern Brazil

The province of São Pedro do Rio Grande do Sul constitutes the extreme southern portion of Brazil. In the salubrity of its climate and the fertility of its soil it

resembles the republic of Uruguay, upon which it borders. All the cereals and fruits of Central Europe can be cultivated, and formerly immense quantities of wheat were grown.

The great wealth of the Rio Grande do Sul consists in flocks and herds. The *gauchos* of Buenos Ayres are not more expert on horseback or more skilful in the use of the lasso than are the Rio Grandenses, whose occupation from childhood is the care and culture of the herds of cattle which roam about the vast *campinus* or prairies. 500,000 cattle are slaughtered annually for the sake of preserving their hides and flesh, while as many more are driven northwards for ordinary consumption.

KIDDER AND FLETCHER.—*Brazil and the Brazilians*. Sampson Low.

By permission of Messrs. Sampson Low.

A Coffee Plantation in Southern Brazil

In Southern Brazil a coffee-field seldom lasts more than thirty years. The plantations are made on the fertile hillsides, where the forest has been growing thick and strong. But the soil is never deep—6 or 8 inches of mould is the utmost. In twenty-five or thirty years the strong-growing coffee trees eat it all up. Most planters simply cut down the forest and leave the trees to dry in the sun for six or eight weeks, when they are burned.

The plants grow and thrive out on the hillside. Warm sunshine caresses the leaves; generous rains feed the little tender roots; the ground is kept free from intruding weeds and bushes; the planter waits for his harvest. After four years the trees are 6 feet high, and begin to bear; by the sixth year the crops are very large—3 or even 4 pounds per tree sometimes. Meanwhile corn and mandioca are planted between the rows; often in a new plantation the expenses are nearly covered by these subsidiary crops.

November is the principal gathering month, and almost the whole plantation force must be at work in the bearing.

orchards. From sunrise to sunset men, women, and children are gathering the berries in baskets, working silently and steadily under the overseer's eye. Every day each hand gathers, on the average, berries enough to produce 50 pounds of dried coffee. The pickings are collected in carts and brought to the mill-house, where the seeds must be prepared for the market.

The coffee-berry is a little larger than a cranberry, and somewhat like one in appearance. Each of the two seeds is enveloped in a delicate membrane, the *pergaminho*; this, being strongly adherent, can only be removed by much rubbing, even when the seed is dry. Outside the *pergaminho* is a much thicker and less adherent covering, the *casquinho*. The two seeds, with their respective inner and outer coverings, are together enclosed in a tough shell, the *casco*, which in turn is surrounded by a thin white pulp and outer skin, forming the berry. Nearly all the processes of preparation seek, first, the removal of the outer pulp, by maceration in water; second, the drying of the seeds, with their coverings; third, the removal of the several coverings after they are dry. To these three processes is sometimes added a fourth, by which the seeds are sorted according to their forms and sizes.

On the hillside, above the mills, there is a cement-lined trough, through which a strong stream of water is running. This water has been carefully cleansed by a series of strainers, and the trough is covered to keep out all rubbish. Through a funnel-shaped opening the coffee-berries are thrown into the stream, which carries them down with it to a large vat; from the bottom of this vat a pipe draws off the heavier berries to the pulping-machine, while the lighter and almost valueless ones are floated off with the surface water to another pipe.

The pulping-machine is simply a revolving cylinder, set with teeth, and covered on one side by a covered sheet of metal, on which it impinges as it turns. The berries, carried to the cylinder with the stream of water, are crushed between it and the cover, and the pulp is thus

loosened. Passing from the pulping-machine to a vat beyond, the water is kept in constant motion by a rapidly revolving wheel; by this means the pulp is thoroughly washed off and carried away with the water, while the heavier seeds sink to the bottom; thence they are carried to a strainer, which drains off the water and leaves the seeds ready for the next stage. They are still enclosed, two together, in the outer and inner shells.

The next process, that of drying, is effected in two different ways. The great cement-covered pavement in front of the house is the *terreiro*, used in the old process; the seeds are simply spread out on it and allowed to dry in the sun. About sixty days are required for this. The new system is drying by steam. This steam process is likely to upset the old system entirely, for by it the coffee is dried thoroughly in a few hours, and the long delay of the *terreiro* is done away with, while the product is much improved in quality. Against the expense of the drying machine, which is not very great, is set the saving of labour. The coffee runs no danger of injury by rains, and the process being a constant and rapid one, there is no accumulation of half-prepared seeds.

The coffee grains are still enclosed in their inner and outer shells, which are now dry and somewhat brittle. The removal of these is effected by a complicated and expensive process.

A large plantation is a little world in itself. There are smithies and workshops, machines for preparing mandioca, a saw-mill and a corn-mill, and a sugar-cane mill, and a still where the cane-juice is made into rum. At one end of the enclosure there is a brick-kiln, and near by a pottery. The machinery is moved partly by a turbine-wheel, but principally by a large steam-engine.

H. H. SMITH.—*Brazil, the Amazons, and the Coast.* Sampson Low.

By permission of Messrs. Sampson Low.

VI. THE PLATE BASIN AND PATAGONIA

The Plate Basin

We climbed the Zenta, whose peak is almost always clad in snow, at a point near the Tropic of Capricorn. The mists rose presently to the mountain tops, and the plain lay clear and distinct before us. The three glittering silver handles are the rivers Paraguay, Upper Parana, and Uruguay. The two first, after hundreds of leagues of separate existence, join in one, under the name of the Parana, a little below Humaita, and almost opposite to the Argentine city of Corrientes. The other—that is, the Uruguay—and the Parana, after 1500 kilometres of an almost parallel course, unite a little above Buenos Aires and form the Rio de la Plata or the Mar Dolce, as it was called by its first discoverers, which at that point is 30 kilometres in width; by a length of 270 ; and at the mouth, where it falls into the Atlantic, between Montevideo and Cape San Antonio, is 160 kilometres wide. The immense basin thus spread out before us is therefore the basin of the Rio de la Plata ; it is in the shape of a horse-shoe, the open part or base lying against the Atlantic, and the upper part towards the equator, and embracing twenty degrees of latitude from the equator—equal to more than as many hundreds of kilometres and fifteen degrees of longitude. The abundant waters of this basin proceed almost entirely from the torrid zone, and are precipitated on the slopes of La Plata from the chain of mountains the opposite sides

of which supply the equally large—nay, even more extensive basin of the Amazons.

The basin of the Rio de la Plata therefore includes the greater part of the Argentine Republic, part of South Bolivia, the whole of the Republic of Paraguay, situated between the Upper Parana and the Paraguay rivers, from the latter of which it takes its name, and the whole of Banda Oriental or Uruguay, which is bounded by the river Uruguay, by La Plata, and the Atlantic, and has Montevideo for its capital, situate on the mouth of the Plata, and also a great part of the Brazilian empire.

The immense plains—perhaps the largest in the world—of the Pampa and the Gran Chaco, the one grassy, the other wooded, lie in the western portion of the basin, on the right and along the estuary of the Rio de la Plata, the Parana, and the Paraguay, bounded on the west by the Cordilleras, and then by the mountains of Cordova, Tucuman, and Oran.

GIOVANNI PELLESCI.—*Eight Months on the Gran Chaco of the Argentine Republic.* Sampson Low.

By permission of Messrs. Sampson Low.

The Plate Estuary

We were now in the estuary of the Rio de la Plata, for the limit of the river and the ocean is held to be a line drawn between Maldonado and Cabo San Antonia, 150 miles across. At Montevideo the river is 64 miles wide. At Buenos Aires, 210 miles higher up than Maldonado, it is 34 miles wide. All this gigantic estuary is obstructed by shoals and sandbanks; the depth of water is hardly anywhere upwards of three fathoms. Luckily the bottom is generally of soft mud; hence there is little risk to a vessel that runs ashore unless the weather be bad. But unfortunately bad weather is very common indeed off the river Plate. It is a region of storms and extraordinary electric disturbance. The *pampero*, the storm-wind of the Pampas, is frequent, and blows with great violence:

often being indeed a true hurricane in its fury. The ocean tides do not affect to any great extent the waters of the river Plate, but strong sea-winds cause it to rise considerably. The water is fresh almost as far as Montevideo, where, indeed, it is occasionally drunk on the vessels in the roads, so slightly brackish is it. A desolate waste of choppy, muddy waves, flowing between dark mud-banks, with here and there little floating islands of lilies, and trees drifting seawards from the great rivers of the interior—such is the mouth of the La Plata, the widest river of the world; and the one which, with the exception of the Amazon, discharges the greatest volume of water into the ocean.

E. F. KNIGHT.—*The Cruise of the "Falcon."* Sampson Low.

By permission of Messrs. Sampson Low.

Uruguay (Banda Oriental)

* The republic of Uruguay is situated in the temperate zone of South America on the left bank of the Rio de la Plata, between $30^{\circ} 5'$ and 35° S. lat., and $65^{\circ} 15'$ and $60^{\circ} 45'$ W. long., from the meridian of Paris. The physical aspect presents a strong contrast with the flat, treeless, and often arid pampas of the Argentine; the Banda Oriental abounds in wood, water, and hills; from end to end the undulation is continuous, and in some departments—for instance, Minas—one might almost imagine one's self in Switzerland, so fine does the hill and mountain scenery become. The climate is moist, mild, and healthy, and there are really only two seasons, summer and winter, with a maximum of 36° Cent. in January and a minimum of 3° above 0° in July. Abundantly irrigated and fertile in the majority of the departments of the republic, the soil produces every kind of grain or fruit known in temperate or sub-tropical climes. For cattle-raising Uruguay is well adapted throughout the year; whereas on the plains of the Argentine, horned cattle and sheep

perish by thousands from want of water and dearth in summer, and from exposure and inundations in winter. An industry derived from the pastoral is that of the *saladeros*—establishments where animals are killed, and their hides, flesh, etc., salted or otherwise utilised. In Uruguay the great *saladeros* are at Montevideo, at the foot of the Cerro, and Fray Bentos, Paysandu, and Salto on the Uruguay River. The model establishment and the most famous is that of Fray Bentos, where Liebig's extract of beef is made.

Almost the third part of the population of the republic lives in Montevideo. Outside Montevideo there is nothing to be seen but undulating prairies, flocks and herds, ranchos, wood, water, sky, and a few human beings riding along with their *ponchos* sweeping their horses' flanks. In the country everything is very primitive, and one is astonished at the rough way in which most of the rich *estancieros* live on their estates in the simplest and most comfortless houses. These men own leagues and leagues of land, and they live, like the patriarchs of old, with two or three generations of children under the same roof, and eating at the same table in the old-fashioned creole way.

T. CHILD. — *The Spanish-American Republics*. Osgood, M'Ilvaine, and Company.

Montevideo

This city has a most attractive appearance, whether seen from a vessel entering port or on the land side from the Cerrito, nor is the favourable impression removed on nearer examination. Standing as it does on a tongue of land, between the bay and the Atlantic, its streets are swept by cool sea-breezes, and it enjoys pre-eminently the pleasantest climate in South America. It is, moreover, the best-built city in the continent.

No other city in South America has greater advantages in geographical position. If a proper port had been constructed fifty years ago, a considerable portion of the



MONTEVIDEO.

world's commerce would have flowed hither, and Montevideo would be to-day another Singapore. Unfortunately the bay got worse by degrees, the depth of water having diminished 5 feet in seventy years, and the roadstead outside the Cerro is so exposed as to be one of the most dangerous in the world.

The Cerro, or mount, which gave Montevideo its name, is the most prominent object, rising to a height of 505 feet, and visible 12 miles out to sea. On the summit is a lighthouse, in the middle of an old Spanish fort, which has frequently been used as a prison for political offenders. The sides of the hill are steep but not precipitous, and a handful of men could hold the fort against an army. The revolving light on the top is visible 25 miles seaward. The bay is here nearly two miles wide, this being the mouth, and as it trends inwards it takes the form of a horse-shoe, with easy accommodation for 500 vessels at anchor, the depth of water rarely exceeding 15 feet. The *saladeros* of the Cerro kill 200,000 cattle yearly, and in the season, when the wind comes from that quarter, the smell in Montevideo is disagreeable.

M. G. MULHALL.—*Handbook of the River Plate*. Stanford.

By permission of Mrs. Mulhall and Mr. Edward Stanford.

Fray Bentos

We reached Fray Bentos about 5 o'clock in the afternoon. At that point the river makes a sharp turn to the east, and widens to an expanse of several miles. Fray Bentos is a small village built upon a high peninsula, with broad macadamised streets and a *plaza* crowded with trees. On a similar headland, about a mile south, are the buildings of the Liebig extract of meat establishment and those of its employees, making a small village by themselves. Half a dozen vessels were in the river, engaged in shipping the well-known juice. The next morning I visited the famous factory. The grounds are surrounded by a high brick wall, entered through a lofty archway. The

manager and superintendents live within this enclosure, though the most of the employees are in the village apart by themselves. The company employs about 1000 hands, who, with their wives and children, form a community of over 2500 people. A short distance out on the pampa there are large corrals, and a stockade-bordered lane leads into the slaughtering-yard. Arrived at this general depot, about 50 cattle are closely penned, and a man standing on the stockade lassoes them one by one, the end of his lasso being attached to a neighbouring winch, turned by steam, which hauls the fated beast, stumbling and slipping and pushing aside all animals in its way till its head touches a beam where stands the matador or killer. This man is armed with a short, broad-bladed, sharp-pointed knife. With one blow, close behind the horns, he severs the spinal cord, and the animal drops with a heavy thud, but without a struggle, upon a small iron truck. This is at once drawn (the lasso having been disengaged) by two men into a great shed, where about 100 men are busily at work skinning and cutting up the carcasses. Not unfrequently the horns of the one lassoed become entangled with the horns of another, and they are brought up to the beam and despatched together. Along one side of the great shed are long ranges of rails for hanging meat, and along the other is a flat, flagged place, slightly shelving, upon which the oxen are laid. Here, by means of a lasso attached to a horse, the animal is hauled into its place, where a skinner is waiting for it. He immediately cuts its throat and begins his work, very rapidly removing the skin. Though the victim's sensation is probably entirely destroyed by severance of its spinal cord, yet muscular action is not; and it is rather ghastly to see the struggles of an animal with half its skin off, and to detect a sound painfully like a bellow. These movements seem to take place when certain nerves about the neck are touched and thus set in action. Soon the animal is cut into a hundred pieces and the parts are quickly sorted and taken in different directions. The meat, warm and quivering, is

cut from the bones and hung upon rails provided for that purpose, and the skins are put into large brine baths for soaking. Entrails, skulls, horns, tongues, hoofs, and even the blood, are carried away. Everything is carefully preserved, and every part of the animal is utilised. Even the bones are ground and mixed with the meat after the extract is obtained, while hide-trimmings and blood are made into an artificial guano which proves a very efficient fertiliser. The skinners wield knives like razors, work with lightning rapidity, and show profound knowledge of bovine anatomy. They will skin and cut an animal into a hundred pieces in eight minutes. The operation has been done in five. Each skinner gets fifteen cents per head; but if in skinning he makes a hole in the skin, he loses his payment for that animal. In the height of the season he disposes of about 35 in a day. When it has cooled the meat is cleared of fat, and is stewed in large oblong cauldrons, in which the water is kept somewhat below the boiling point, as it is a peculiarity of the extract that it contains no matter not soluble in cold as distinguishable from boiling water. The thin soup so obtained is then strained off and carefully skimmed, which removes any trace of grease that may have remained in the meat. It is then passed through a series of elaborate evaporations, out of each of which it comes thicker, until it reaches a consistency rather more solid than treacle. The liquid becomes a jelly on cooling. It is now ready for use, and is packed in large tins holding about 110 lbs. of the extract. Each of these tins contains, on an average, the substance of 15 animals, and is worth about 250 dollars. The tins are exported in that form to Antwerp, where they are examined by a special chemist attached to the company's general depot, after whose approval and guarantee as regards composition and flavour the extract is potted, put up in cases, and sent out to all the markets of the world.

F. VINCENT.—*Around and About South America.* Appleton.

By permission of Mr. F. Vincent and Mr. D. Appleton

Up the Parana-Paraguay

We entered the Parana by its main branch, the "Guazu," having passed the island of Martin Garcia, which may be called the Gibraltar of the river Plate, as all vessels going up either the Parana or Uruguay rivers must pass within range of its batteries. This portion of the Parana, with its innumerable islands and labyrinth of channels, is used by the fruiterers and charcoal-burners. The former, during the season, lay their barques against the banks, and load from the overhanging peach and orange trees. The peach trees are cultivated not only for their fruit but also for their firewood.

At sunset we were called up from dinner by the first lieutenant to see a tiger, or rather a jaguar, that was swimming across the river; nothing was visible but his head, and he swam in a straight line, with a powerful stroke, perfectly heedless of the current. A thick jungle of marshy grass and tangled underwood, which almost defied the entrance of man, afforded a secure asylum for these animals, which at times cross the river in search of a sheep or a calf in the farms of Entre Rios or Corrientes. In many places the casual groupings of foliage, broken here and there by lovely rivulets which tempt you to follow their mysterious recesses, presented a picture that Salvator Rosa or Claude Lorraine would have delighted to paint. It is a pity to think that these islands can never be turned to any purpose or defended against the torrent, for the soil is so loose that it will hold no structure. Green rafts, or "camelotes" composed of canes and brushwood, are occasionally carried down by the inundations, bearing on them the jaguar, cayman, squirrels, and other animals which are said to enjoy their floating habitation. No less than four tigers landed in this manner one night at Montevideo, to the great alarm of the inhabitants, who found them prowling about the streets in the morning.

Coming on deck this morning I was greatly struck with the picturesque situation of Corrientes, with its palm trees and orange-groves.

Between Rio Appa and Bourbon the ground became higher, and the river widened considerably. Fort Bourbon or Olimpo, the first Brazilian landmark met with on the Paraguay, is built on a spur of the Sierra Olimpo, a well-wooded range. Another palm-forest, and, as the sun broke through the clouds, it shone on a belt of trees in yellow blossom that looked like burnished gold. Purple and dark green foliage diversified the landscape, and a flight of toucans, with their gray and black plumage and orange breasts, lent some life to a scene otherwise mournful from the surrounding solitude and silence. The river now seemed to have forced its way through a magnificent group of hills, the highest, Pan de Azucar, being 1350 feet. All these mountains were clad with the most luxuriant foliage, and I noticed trees, the flowers of which resembled our horse-chestnut, of different colours; but I was told that they were always white first, afterwards changing to yellow and deep crimson.

Above Coimbra the islands become very numerous, mostly wooded; there were birds of the richest plumage, and the alligators were so thick on the banks that we could scarcely see the sand. Now and then deer showed themselves on the banks. Just as the sun was setting we came to the magnificent peak of Conselho, rising from the river bank 1500 feet, clad in richest timber of variegated foliage, with lower hills that were lost in the Chaco.

At last we are in the very heart of South America, having ascended these rivers for 1800 miles, and here may be said to terminate the ordinary navigation. Canoes, however, can go up the Villa Maria, 800 miles further, on the river Paraguay, or to Cuyaba, 600 miles, by the San Lorenzo. The scenery was magnificent, as we stopped at the foot of Cerros Dourados to take in wood. The hill-sides were covered with wild fig and other trees. There was a little settlement of woodcutters, whose houses were

like the palm huts of Paraguay. They told us that tigers and snakes were very abundant. We sailed for miles along the foot of the Dourados Mountains, the scenery varying in beauty at every point.

At 130 miles from Curumba we entered the San Lorenzo, having navigated the Paraguay 1100 miles from its mouth at Tres Bocas. Shoals of alligators lay along the banks, of a larger kind than those of the river Paraguay. The scenery of the San Lorenzo was only wood and water, but beautifully diversified. On our right bank were tall trees covered with balls of wild cotton, larger than an orange, called payna, which serves to make pillows as soft as eider down. Both banks of the river were low and swampy and fringed with timber.

Leaving the river San Lorenzo we entered the Cuyaba, which was much narrower although the same in other respects. The Cuyaba rises near the 13th degree of latitude, from 30 to 40 leagues above the capital, and within a few miles to the east of the sources of the river Paraguay. Navigation was much impeded by trees which fell into the river, being undermined by the stream or loosened by the inundations, and in some places we had to stop and cut them down to allow the steamer to pass. The monkeys sat grinning at us, but took care to keep out of our way. One kind known as the bearded monkey, was strangely like a man. The bed of the river became so narrow that the branches of the trees struck us. The climbing plants, loaded with flowers, gave the trees the most wonderful forms that the richest imagination could invent.

Two or three times to-day we called at *fazendas*, which now begin to appear at both sides of the river. These *fazendeiros* live on fish, fruit, mandioca, and sugar-cane, but rear cattle and poultry to sell to canoes going up or down. They lead happy lives, undisturbed by the changes so common in other parts of South America, and are once a year visited by a priest, who comes round to christen and marry. Eighty miles from Cuyaba both sides of the river are thickly studded with well-cultivated *fazendas*.

As soon as our canoe got abreast of the Coxipo River the turrets of Cuyaba were visible, the distance by land being half of that which our course by water obliged us to go. Along the banks on either side were charming little plantations. The port was full of *igarites*, belonging to market-people who had arrived at this early hour—before sunrise; women, wearing red blankets, carried on their heads baskets of fish, fruit, or cakes of sugar.

We passed numbers of them as we proceeded afoot towards Cuyaba, following a rocky and uneven road over two rows of hills. From the top of the second range we had a fine view of the capital; the houses had tile roofs, most of them being two or three stories high. The outlines were irregular, as the houses were built here and there on the sides of the hills, wherever the first settlers found gold, and overshadowed by magnificent palms and bananas. At our feet was the *plaza* or great square, with the cathedral on one side, the President's palace on another, and not far off the massive building of the Bishop's College. After coming so many thousands of miles through savage wilds it astonished me to see so large a city completely isolated from the rest of the world.

Mrs. M. G. MULLHALL.—*Between the Amazon and the Andes.*
Stanford.

By permission of Mrs. Mullhall and Mr. Edward Stanford.

Paraguay

Lying at the point of confluence of the two rivers, the Parana and the Paraguay, the territory of the republic is divided by the latter stream into two distinct sections, situated respectively east and west. This natural division of the country is not merely geographical, but corresponds with the geological formation of soil, as likewise with the economical condition of the inhabitants. Well-defined botanical regions correspond to the geographical division of the country into an eastern and a western section. In the east—that is, Paraguay proper—the prevailing feature con-

sists of virgin forests, with majestic trees, tangled lianas, and brilliant flowers, these being broken ever and again by vast tracks of pasturage consisting of tall bushy grass and hills covered with pindo and other palms. There are likewise groves of orange trees never failing to bear fruit, clumps of bananas, and large round bushes of timbos, which in the spring are gay with bright violet blossoms. The Chaco, on the other hand, presents the bare aspect of a heath, occasionally marshy or dotted over with palms known as yatais, rarely growing close enough together to make a grove. Here and there, on rising ground, or when the primeval rock comes to the surface, the monotony of the landscape is relieved by dense quebracho forests which break the grey and weary line of the horizon. Paraguay is not a mountainous country, yet, when compared with the flats of the Argentine Republic, it might almost be classed as one of the most hilly districts of Central America. Yet no imposing ranges are to be found there, and the name of mountain can hardly be assigned to the succession of hills of which the loftiest rarely exceed 1500 feet in height.

Starting from the banks of the Paraguay, and proceeding towards the eastern frontier, the traveller will at first cross slightly undulating plains, over which, in countless meanderings, flow the streams that descend from the central watershed. As he advances he will observe that the scenery alters its character; the hills become more numerous, the horizon grows more contracted, and eminence after eminence, surrounded by luxuriant verdure, breaks upon the view. No sharp peak or rugged crest ever interrupts the rounded outline of the distant ridges. Occasionally in a gorge somewhat narrower than the rest, though not deep enough to be sombre, a mountain stream leaping down amongst barren rocks will appear to be assuming the character of a torrent; but in its general aspect the country has none of the stern and rugged features of a true mountainous region. Only in the Andes are tokens of the convulsions of the, rocks to

be observed. Here everything is smiling and harmonious. The culminating point of the central chain is also distinguished by a somewhat sharper outline, while from its forest-bed a rocky crest uprears itself, in striking contrast to the bush-mantled surface of its lower ridges. And yet, like the Andes, these hills have passed through a period of great and terrible dislocation; the time has been when they have reared up their lofty summits to the skies. Long before the mighty upheaval of the great Cordillera these very hills sustained the continent of America and protected its eastern plateaux from the incursions of the sea. The action of the climate has wrought their decapitation; torrents unceasing and inexhaustible, permeating the entire soil while it was in the very process of formation, debased their topmost crests, filled up their crevices, and little by little the unremitted work of erosion denuded the mountain-flanks of the granite by which they were upheld. Portion after portion has crumbled away, and the fragments have had an enormous share in filling up the vast estuaries which indented the American coast-line at the tertiary era. Towards the north, in the direction of the extensive plateaus which divide the basin of the Amazon from that of the Parana, there survive some imposing ridges which have resisted the action of time. Here the streams, near their original sources, had not acquired sufficient momentum to have the effect of levelling the mountain-tops in the descent; it was only lower down, as they approached the ocean, that they had accumulated the volume and velocity that displaced or destroyed whatever obstructed them, so that the whole chain of mountains was so near being annihilated that only the rarest traces of its former existence can be found. And, more than this, not only have the ominences been levelled, but such has been the violence of the waters that ever and again have they ploughed for themselves a passage through deep ravines. Although the development of these great geological phenomena has thus to so large an extent effaced the primeval outline of the sierra,

and its residuum is now concealed by a luxuriant overgrowth of tropical vegetation, yet the historical importance of the ridge is still apparent from its very position, and from the part which it fulfils as the division-line of the waters.

BOURGADE DE LA DARDYÉ.—*Paraguay.* George Philip and Son.

By permission of Messrs. Philip and Son.

Yerba-maté

Paraguay tea, which is called *yerba-maté* in Spanish, is made from the leaves of the *Ilex paraguayensis*. The Indians introduced it to their Spanish conquerors, and from the date of its discovery it has been the common drink of the populations that have come to seek their fortunes in the New World. At present the use of maté is still spreading and becoming universal throughout South America; not only is it drunk by the descendants of the ancient conquerors, but it is highly appreciated by all new-comers. So far from decaying, as for a while looked likely, the yerba industry is growing, continually promoted by the arrival of the immigrants who increase the demand. The great forests where the ilex abounds are in the eastern part of Paraguay. To reach these forests, long desolate tracts have to be crossed; the gatherings entail much labour, and the responsibility of the head *yerbatero*, who has to convey the products of the harvest out of the wilderness, are considerable. Speaking generally, the working of the yerba-maté industry may be said to consist of four operations: 1st, the gathering; 2nd, the preparation of the leaves; 3rd, the conveyance to the head depot and the packing; and 4th, the transport to the different markets.

BOURGADE DE LA DARDYÉ.—*Paraguay.* George Philip and Son.

By permission of Messrs. Philip and Son.

Oranges in Paraguay

It is affirmed that the orange is not indigenous to Paraguay, but I have great difficulty in believing it. Everywhere, on the banks of the rios, in the gorges of the far-off sierras, near the ranchos, round the estancias, in the solitudes of the forests, the trees are seen with their golden fruit and deep green foliage, in lines, in terraces, in groves—everywhere, on mountains and on plains, they grow and break the blue horizon with their rounded outline, and it seems as if they must have flourished here from all antiquity. The great orange season is from the beginning of May to the end of August. By this I mean that the operation of gathering the fruit goes on at that time; but the trees are in bearing more or less all the year round, neither fruit nor blossom ever completely failing; they mingle one with the other, and give their witness to the perpetual fecundity of the species. One of the chief features of the trade is the conveyance of the fruit to the various marts. All along the Paraguay, from Asuncion to Humaita, during the four winter months, sailing-boats and steamers are in constant employment carrying cargoes of oranges from the depots, such as Villeta or San Antonio, to which they have been brought in carts containing loads of about 5000, which can only be drawn laboriously by three yokes of oxen each. Very frequently, before being delivered at the port, an orange-crop will have been purchased by brokers who have gone up the country and bought it on the spot; but it is quite common for the growers themselves to offer it for sale upon the quay, and a buyer is not often long in being found. The fruit is taken from the carts and piled up on the quay in places reserved for it and handy for shipping. And a picturesque sight it is to watch the Paraguayan women, always lithe and graceful, laughing merrily over their work as they rush like a troop of ants, and carry their loads dexterously from the pier over the gangways, and deposit them in the

holds of the steamers, which are dispatched with all haste to Buenos Aires and Montevideo to meet a demand that is never adequately supplied. To reckon up the number of oranges that are consumed in the country, so as to include those that rot on the trees or that are devoured by the birds, monkeys, and other animals, would be about as difficult as to count the grains of sand on the sea-shore. Hardly a Paraguayan could be found who does not suck from twenty to thirty oranges a day, and yet there is no sign of diminution of the golden crop amidst the dark-green foliage.

BOURGADE DE LA DARDY.---*Paraguay.* George Philip and Son.

By permission of Messrs. Philip and Son.

Buenos Aires

Buenos Aires is the most important town in the southern hemisphere. It surpasses Rio Janeiro, Melbourne, and Sydney in population. It is the Paris of South America. Were the streets wider and the houses higher, it would be a handsome city. As it is, even the best quarters of the town have a mean and cramped situation. The houses are only one storey high, with a flat roof. The windows are on a level with the pavement, and guarded by iron railings and shuttered, which gives rather a grim, dull appearance. The old Spanish custom is universal of the houses being built round a *patio*. Very pleasant and cool look these pretty patios, of which we catch passing glimpses through the light filigree grille that guards them from the street, with their tessellated marble pavements in blue and black, their palms and flowering shrubs clustered round a splashing fountain.

Buenos Aires has many suburbs, the chief of which are Flores, Belgrano, and Quilmes, and here most of the foreigners reside. Belgrano is a long drive of six or seven miles through the Avenue General Alvear, beginning with some of the palatial residences of the *élite* of Spanish society. These splendid houses, with their recessed

balconies, their pretty gardens full of palms and banksia roses, command a view over the river Plate.

A lovely afternoon found us on our way out to Flores. After going out into the country some six miles we still found ourselves in the same street, and at No. 7000 odd. Very pretty are these villas, each surrounded by a garden full of palms, with such voluptuous hedges of roses, whilst pale yellow tea-roses form creepers of tropical growth on the walls and balustrades, and fountains play into a basin of gold fish. The variety is infinite and pleasing.

LADY VINCENT.—*China to Peru.* Sampson Low.

By permission of Messrs. Sampson Low.

From Buenos Aires to Tucuman

From Buenos Aires to Tucuman by this tropilla-track, which winds a good deal, is 1119 English miles, according to an old Argentine postal road-book which a friend lent me. By following this route we should see a good deal of the country, and also much variety of scenery. It was curious to observe the gradual change in the vegetation as we advanced northward to tropical Tucuman, which is eight degrees nearer the equator than Buenos Aires is. First comes the green Pampas of Santa Fé, where the rainfall is considerable and the climate temperate; then gradually drier lands, the campo Cordoba, where water is scarce and the sky is cloudless for long months of drought; then the regions of the monte, the bush that forms the northern limit of the Pampas; and then a hotter and drier land, where spinous bushes and giant cacti of many species can alone extract nourishment from the arid, sandy soil, encrusted as it is with glittering salt. Finally another change comes—a range of stupendous mountains blocks the horizon, the sierras of Tucuman and Aconquija, branches of the Andes, whose summits attain the height of 17,000 feet—mothers of many rivers. Under their giant shadows spreads a great plain, a land of streams and much rain, a steaming hot, unhealthy region, breeding fatal fevers, yet

rich withal, with great plantations of sugar-cane waving in the tepid breeze, and brilliant orange-groves ever noisy with parrots and other gorgeous birds of the tropics—for this is the province of Tucuman, known far and wide as the garden of South America.

E. F. KNIGHT.—*The Cruise of the "Falcon."* Sampson Low.

By permission of Messrs. Sampson Low.

The Chaco

The Chaco is the more northern portion of that great estuarine plain whose southern part is so well known to us as the Pampas, and which forms a large portion of the basin of the Rio de la Plata. In its physical features the Chaco agrees in many points with the Pampas; the sharp line of demarcation between them is due rather to their botanical characteristics. The Pampa is open, grassy, and treeless; the Gran Chaco, on the other hand, possesses luxuriant forests. Its surface is almost uniformly level, broken only by almost imperceptible undulations, and with a general slope of from 8 to 10 inches per mile towards the south-east. The mean height above sea-level of the Chaco Central may be taken as above 450 feet.

Upon its western border many streams pass into the Chaco from the valleys of the Andes. These wind hither and thither on the almost level plain, traversing extremely tortuous courses, and thus exposing an immense surface to evaporation. The effect of this, coupled with the extreme dryness of the climate, is to cause the volume of these streams greatly to diminish during their plain track, and it is only the very largest and most rapid-flowing which during dry seasons manage to convey any of their waters into the Paraguay. In point of fact, besides the Salado, which bounds its southern margin, we may say there are only two rivers which permanently carry water right across the Chaco. They are the Bermejo and the Pilcomayo.

Looking around from my present position, I find myself

in a typical piece of Chaco scenery: an immense and almost uniformly level plain stretches into the distance on all sides—a plain covered with tall, waving grass, and thickly studded with tall and slender fan-palms. We are, in fact, in the midst of the immense *palmar* or palm forest, which extends over almost the entire Chaco, covering thousands upon thousands of square miles. Looking in certain directions nothing is to be seen but an endless vista of the palm trees stretching away until they become dim and hazy in the distance. In other directions, one sees the banks of the winding river marked out by a fringe of green wood; and, if we take horse and penetrate some little distance, we find that the scenery, at first so monotonous, is not without a certain amount of variety. At one point one finds the growth of palms to cease, and we have apparently gigantic meadow covered with green verdure, and stretching for several miles, undotted by a single palm or tree. Anon one finds one's self in a scene like an English park—an expanse of green turf dotted with isolated trees and bushes; while again one has the range of vision bounded by the sharp and wall-like margin of a belt of dicotyledonous forest. If one penetrates the latter, one finds one's self in a mass of dense and scrubby small trees, while large forest trees occur only occasionally, towering singly far above their fellows. So much for the general aspect of the Chaco scenery. Animal inhabitants one sees but little of. As in the early morning one passes the margin of a marsh, one may see great marsh deer grazing quietly, or by the margin of a forest a troop of peccaries may be seen grubbing in the ground for roots. There are, of course, many other mammalian inhabitants, but they can scarcely be considered as prominent features in the scenery. Of birds one occasionally sees a troop of tall rheas go scuttling off in the distance; flocks of parrots fly overhead with shrill screams; while hammering vigorously on a tree-trunk may be seen a pair of big woodpeckers with gorgeous pointed cowl of the most vivid scarlet. By night, when all is hushed, when not a breath of air is

stirring, and when the stars are shining out like jewels in the clear sky, other bird inhabitants of the Chaco make themselves known by their voices. The deep and sepulchral "boo-hoo-boo" of the great nacurutu or Virginian owl alternates with the wild shriek of the ypecha, the harsh cries of the charata, and the soft and mournful "tururu-hoo-hoo" of the Cholibá owl; while as an accompaniment to all is the endless concert of crickets and frogs.

As regards human beings, the sole inhabitant of these wilds is the Red Indian, still proud and untamed as when Europeans first landed in America.

J. G. KERR. — *Scottish Geographical Magazine*, February 1892.

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The Pampas

The great plain, or Pampas, on the east of the Cordillera, is about 900 miles in breadth; and the part which I have visited, though under the same latitude, is divided into regions of different climate and produce. On leaving Buenos Aires the first of these regions is covered for 180 miles with clover and thistles; the second region, which extends for 450 miles, produces long grass; and the third region, which reaches the base of the Cordillera, is a grove of low trees and shrubs. The second and third of these regions have nearly the same appearance throughout the year, for the trees and shrubs are evergreen, and the immense plain of grass only changes its colour from green to brown; but the first region varies with the four seasons of the year in a most extraordinary manner. In winter the leaves of the thistles are large and luxuriant, and the whole surface of the country has the rough appearance of a turnip-field. The clover in this season is extremely rich and strong, and the sight of the wild cattle grazing in full liberty on such pasture is very beautiful. In spring the clover has vanished, the leaves of the thistles have extended along the ground, and the country still looks like a rough crop of turnips. In less than a month the change is most extra-

ordinary; the whole region becomes a luxuriant wood of enormous thistles, which have suddenly shot up to a height of 10 or 11 feet, and are all in full bloom. The road or path is hemmed in on both sides; the view is completely obstructed; not an animal is to be seen; and the stems of the thistles are so close to each other and so strong that, independent of the prickles with which they are armed, they form an impenetrable barrier. The summer is not over before the scene undergoes another rapid change; the thistles suddenly lose their sap and verdure, their heads droop, the leaves shrink and fade, the stems become black and dead, and they remain rattling with the breeze one against another, until the violence of the pampero or hurricane levels them with the ground, where they rapidly decompose and disappear; the clover rushes up, and the scene is again verdant. The vast region of grass in the pampas for 450 miles is without a weed, and the region of wood is equally extraordinary. The trees are not crowded, and one may gallop between them in every direction. The young trees are rising up, others are flourishing in full vigour, and it is for some time that one looks in vain for those which in the great system of succession must necessarily somewhere or other be sinking towards decay. They are at last discovered; but their fate is not allowed to disfigure the general cheerfulness of the scene, and they are seen enjoying what may literally be termed a green old age. The extremities of their branches break off as they die, and when nothing is left but the hollow trunk it is still covered with twigs and leaves, and at last is gradually concealed from view by the young shoot, which, born under the shelter of its branches, now rises rapidly above it and conceals its decay. A few places are met with which have been burned by accident, and the black, desolate spot, covered with the charred trunks of trees, resembles a scene in the human world of pestilence or war. But the fire is scarcely extinct when the surrounding trees all seem to spread their branches towards each other, and young shrubs are seen rising out

of the ground, while the sapless trunks are evidently mouldering into dust. The rivers all preserve their course, and the whole country is in such beautiful order that if cities and millions of inhabitants could suddenly be planted at proper intervals and situations, the people would have nothing to do but to drive out their cattle to graze, and, without any previous preparation, to plough whatever quantity of ground their wants might require. The climate of the pampas is subject to a great difference of temperature in winter and summer, though the gradual changes are very regular. The winter is about as cold as our month of November, and the ground at sunrise is always covered with white frost, but the ice is seldom more than one-tenth of an inch thick. In summer the sun is oppressively hot, and its force is acknowledged by every living animal. The wild horses and cattle are evidently exhausted by it, and the siesta seems to be a repose which is natural and necessary to all. The middle of the day is not a moment for work, and the mornings are cool; the latter are evidently best adapted for labour, and the former for repose. The difference between the atmosphere of Mendoza, San Luis, and Buenos Aires, which are all nearly under the same latitude, is very extraordinary; in the two former, or in the regions of wood and grass, the air is extremely dry; there is no dew at night; in the hottest weather there is apparently very little perspiration, and the dead animals lie on the plain dried up in their skins, so that occasionally I have at first scarcely been able to determine whether they are alive or dead. But in the province of Buenos Aires, or in the region of thistles and clover, vegetation clearly announces the humidity of the climate. In sleeping out at night I have found my *poncho* (or rug) nearly wet through with the dew, and my boots so damp that I could scarcely draw them on. The dead animals on the plain are in a rapid state of putrefaction. On arriving at Buenos Aires the walls of the houses are so damp that it is cheerless to enter them; and sugar, as also all deliquescent* salts, is

found nearly dissolved. This dampness, however, does not appear to be unhealthy. The Gauchos, and even travellers, sleep on the ground, and the inhabitants of Buenos Aires live in their damp houses without complaining of rheumatism or being at all subject to cold; and they certainly have the appearance of being rather more robust and healthy than those who live in the drier regions. However, the whole of the pampas may be said to enjoy as beautiful and as salubrious an atmosphere as the most healthy parts of Greece and Italy, and without being subject to malaria. The only irregularity in the climate is the pampero, or south-west wind, which, generated by the cold air of the Andes, rushes over these vast plains with a velocity and violence which it is almost impossible to withstand. But this rapid circulation of the atmosphere has very beneficial effects, and the weather after one of these tempests is always particularly healthy and agreeable.

SIR F. B. HEAD.—*Head's Rough Notes.*

The Pampero

No one can reside here, even for a few months, and fail to observe one very general rule in the meteorological changes over this portion of the continent. For days, or for weeks even, the wind will blow from the north, and all this time the weather will become sultrier and sultrier, and more and more oppressive with the pent-up electricity, until at last, to the relief of all nature, there will be a crash of thunder and torrents of rain, and the cold hurricane of the pampero will sweep over the parched land, more or less violent, according to the previous duration of the north wind, and hence the greater or lesser intensity of that exceptional electric condition of the atmosphere.

For four days the north wind had been blowing, and now, on the 16th, the weather became intolerably oppressive. The hot parching wind seemed to dry up the pores of the skin,

and so enervated us all with its poisonous breath that we were too languid and uncomfortable even to eat our breakfasts, or row on shore, or undertake the slightest exertion. And thus was it not only with us, but with all animal life. The shores of the river, ordinarily so noisy with the songs of birds and chirping of shrill cicalas, and a thousand mingling cries, were as silent now as if death had suddenly fallen on the land. All nature was in suspense.

In the afternoon the stifling sensation was more intense, the air was suffocating, and the wind entirely died away. The barometer fell rapidly, and at six in the evening a ruddy light came up in the south-west. The tension was about to be broken; the stillness was full of awe; then, with a hissing sound, the hurricane came rushing up the river, with its accompaniment of plentiful rain, vivid lightning, and loud thunder. The sky assumed an extraordinary lurid colour that was reflected by all the landscape. What was the most remarkable was the instantaneous and violent change of temperature, and general sensation of relief. We were now shivering with cold before the bracing gale, and all our languor was dispelled in a moment.

E. F. KNIGHT.—*The Cruise of the 'Falcon.'* Sampson Low.

By permission of Messrs. Sampson Low.

The Vegetation of the Pampas

In most places the rich, dry soil is occupied by a coarse grass, 3 or 4 feet high, growing in large tussocks, and all the year round of a deep green; a few slender herbs and trefoils, with long twining stems, maintain a frail existence among the tussocks; but the strong grass crowds out most plants, and scarcely a flower relieves its uniformly everlasting verdure. There are patches, sometimes large areas, where it does not grow, and these are carpeted by small creeping herbs of a livelier green, and are gay in spring with flowers, chiefly of the composite.



PAMPAS GRASS AND INDIANS.

and papilionaceous kinds; and verbenas, scarlet, purple, rose, and white. On moist or marshy ground there are also several lilies, yellow, white, and red, two or three flags, and various other small flowers; but altogether the flora of the pampas is the poorest in species of any fertile district on the globe. On moist clayey ground flourishes the stately pampa grass (*Gynerium argenteum*), the spears of which often attain a height of 8 or 9 feet. I have ridden through many leagues of this grass with the feathery spikes high as my head, and often higher. It would be impossible for me to give anything like an adequate idea of the exquisite loveliness, at certain times and seasons, of this queen of grasses, the chief glory of the solitary pampa. In some places, where scarcely any other kind exists, it covers large areas with a sea of fleecy white plumes; in late summer and in autumn the tints are seen, varying from the most delicate rose, tender and illusive as the blush on the white under-plumage of some gulls, to purple and violaceous. At no time does it look so perfect as in the evening, before and after sunset, when the softened light imparts a mistiness to the crowding plumes, and the traveller cannot help fancying that the tints, which then seem richest, are caught from the level rays of the sun, or reflected from the coloured ray of the after-glow.

At other hours and seasons the general aspect of the plain is monotonous, and in spite of the unobstructed view, and the unfailing verdure and sunshine, somewhat melancholy, although never sombre; and doubtless the depressed and melancholy feeling that the pampa inspires in those who are unfamiliar with it is due in a great measure to the paucity of life and to the profound silence. The wind, as may well be imagined on that extensive level area, is seldom at rest; there, as in the forest, it is a "bard of endless breathings," and the strings it breathes upon give out an endless variety of sorrowful sounds, from the sharp, fitful sibilations of the dry, wiry grasses on the barren places, to the long mysterious moans that

swell and die in the tall polished rushes of the marsh. It is also curious to note that with few exceptions the resident birds are comparatively very silent, even those belonging to groups which elsewhere are highly loquacious.

W. H. HUDSON. . . *Naturalist in La Plata.* Dent.

By permission of Mr. W. H. Hudson and Mr. Dent.

The Gauchos of the Pampas

The population or number of these Gauchos is very small, and at great distances from each other; they are scattered here and there over the face of the country. Many of them are descended from the best families in Spain; they possess good manners, and often very noble sentiments; the life they lead is wild, but interesting. Born in a rude hut, the infant Gaucho receives little attention, but is left to swing from the roof in a bullock's hide, the corners of which are drawn towards each other by four strips of hide. In the first year of his life he crawls about without clothes, and I have more than once seen a mother give a child of this age a sharp knife, a foot long, to play with. As soon as he walks, his infantine amusements are those which prepare him for the occupations of his future life; with a lasso made of twine he tries to catch little birds, or the dogs, as they walk in and out of the hut. By the time he is four years old he is on horseback, and immediately becomes useful by assisting to drive the cattle into the *corral*. The manner in which these children ride is quite extraordinary; if a horse tries to escape from the flock which are driven towards the *corral*, I have frequently seen a child pursue him, overtake him, and then bring him back, flogging him the whole way; in vain the creature tries to dodge and escape him, for the child turns with him, and always keeps close to him; and it is a curious fact, which I have often observed, that a mounted horse is always able to overtake a loose one. His amusements and his occupations soon become

more manly ; careless of the *biscacheros* (the holes of an animal called the *biscacho*), which undermine the plains, and which are very dangerous, he gallops after the ostrich, the gama, the lion, and the tiger ; he catches them with his balls ; and with his lasso he daily assists in catching the wild cattle, and in dragging them to the hut, either for slaughter or to be marked. He breaks in the young horses in the manner which I have described, and in these occupations is often away from his hut many days, changing his horse as soon as the animal is tired, and sleeping on the ground. As his constant food is beef and water, his constitution is so strong that he is able to endure great fatigue ; and the distances he will ride, and the number of hours he will remain on horseback, would hardly be credited. The Gaucho has by many people been accused of indolence ; those who visit his hut find him at the door with his arms folded, and his poncho thrown over his left shoulder like a Spanish cloak ; his hut in holes, and would evidently be made more comfortable by a few hours' labour ; in a beautiful climate, he is without fruit or vegetables ; surrounded by cattle, he is often without milk ; he lives without bread, and he has no food but beef and water, and therefore those who contrast his life with that of the English peasant accuse him of indolence ; but the comparison is inapplicable and the accusation unjust ; and any one who will live with the Gaucho, and will follow him through his exertions, will find that he is anything but indolent, and his surprise will be that he is able to continue a life of so much fatigue. It is true that the Gaucho has no luxuries ; but the great feature of his character is, that he is a person without wants ; accustomed to live constantly in the open air, and to sleep on the ground, he does not consider that a few holes in his hut deprive it of its comfort. It is not that he does not like the taste of milk, but he prefers being without it to the everyday occupation of going in search of it. He might, it is true, make cheese, and sell it for money ; but if he has got a good saddle and sharp spurs, he

does not consider that money has much value ; in fact, he is contented with his lot ; and when one reflects that, in the increasing series of human luxuries, there is no point that produces contentment, one cannot but feel that there is perhaps as much philosophy as folly in the Gaucho's determination to exist without wants.

SIR F. B. HEAD.—*Rough Notes.*

Patagonia

The attention of the traveller in Patagonia, if he is endowed with any of the instincts of a naturalist, is first attracted to the long line of cliffs that everywhere on the eastern coast rise boldly from the sea to a height of from 300 to 500 feet. While still far out at sea this is discernable to the experienced eye of the navigator, though to the landsman it may appear as a low cloud or fog-bank, to either of which illusions its usually unbroken summit and dull gray colours freely lend themselves. As the vessels approach some one of the harbours of this coast, commonly located at the mouths of the rivers, its true nature soon becomes apparent, and it develops as a great sea-wall, stretching far away on either hand until lost in the northern and southern horizons. This line of bluffs extends throughout the entire eastern coast of Patagonia, with but occasional interruptions at the mouths of the few rivers that, flowing eastward from the Andes across the plains, discharge their waters into the South Atlantic. Ascending the bluff we enter upon a broad, elevated plain, stretching to the base of the Andes. Its surface, with a thin veneer of soil vainly endeavouring to conceal the rocks beneath, is scantily covered with grass. Occasional bushes, seldom attaining a height of more than 5 or 6 feet, appear especially favoured localities. Bands of guanaco, or South American camels, and flocks of rheas, the so-called ostrich, feed here in great numbers, and provide the chief sustenance

of the Patagonian traveller, as also of the Patagonian Indians.

Scattered over the surface of the plains in considerable numbers are great depressions or rather excavations, frequently several miles in diameter, and from 100 to more than 1000 feet in depth, as observed in some instances near the base of the Andes. The bottoms of these depressions are usually occupied by small saline lakes. In periods of drought, which occur annually in this region, usually from December to April, the volume of water in such lakes is much reduced by evaporation, and beds of almost pure salt are precipitated, occasionally attaining a thickness of several feet.

Other features to be noticed are the broad, deep, transverse valleys that cross Patagonia from west to east, and form the chief drainage system. These are all true valleys of erosion, and along their bottoms in most cases still flow the streams by which they have been eroded.

Another feature characteristic of these plains is the series of escarpments, often several hundred feet in height, that terminate a succession of terraces, encountered at varying elevations as one proceeds from the coast inland westward to the Andes, or also in crossing from north to south any of the great transverse valleys. Such escarpments have a general trend somewhat parallel to that of the present coast line, but extend inland for many miles along either side of the valleys of all the more important watercourses, as do also the present bluffs of the sea. They are perhaps remnants of bluffs formed along the coast at different stages during the former depression and late elevation of the land, which would appear to have been intermittent, and of which we have exhibited in the present bluffs of the sea the last stage. Between each successive escarpment, a narrow, level plain extends, gradually increasing in altitude to the westward.

In many places over the plains the sedimentary rocks are covered with sheets of lava, which have usually had their origin in local dykes or volcanoes. Many of the latter rise high above the surrounding plain as imposing

landmarks, serving alike to guide the traveller and lend variety to a rather monotonous landscape.

That region lying between the western border of the lava beds and the foot-hills of the Andes is by far the most fertile of the Patagonian plains. Its surface, covered to a considerable depth with glacial deposits, presents a series of low, rounded hills, left as terminal moraines by the receding ice. Such ranges of hills have a trend parallel with the base of the mountains, and are usually separated by broad stretches of meadow land, with numerous small glacial lakes, either occupying slight depressions in the meadows, or, as more frequently seen, embraced by the low rounded hillocks of the terminal moraines. These special conditions are specially characteristic in this region over the bottoms and slopes of the great transverse valleys, but they extend also in many places out over the surface of the high pampas.

The rolling surface of this western plains region, abounding in wide pasture lands, dotted over with sparkling lakes of pure water, presents a pleasing contrast to the semi-arid region near the coast, and affords a welcome relief to the traveller after a journey across the black, absolutely barren lava beds of the central plains. Its modest, unobtrusive beauty but emphasises the grander scenery beyond, indications of which already appear in the distant ranges of the Andes, whose summits, buried deep in fields of snow and ice, are seen brilliantly white against the intensely black background formed by the storm-clouds of the western sky.

Entering the confines of the Andes, numerous rivers, deep rocky cañons, broad open lakes of beautiful clear water, fed by glaciers that descend from the snow-fields at the summits, and all the other features characteristic of an intensely rugged mountainous region, thrust themselves upon the attention and excite the wonder and admiration of the traveller.

J. B. HARTNER. - *National Geographic Magazine*, February 1900.

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Vegetation of Patagonia

According to its flora, Patagonia may be divided into three regions, characterised not so much by differences in species represented (for one of these regions may be fairly considered as furnishing all the species of plants found in the other two), as by the quantity and quality of the vegetation. The first of these may be designated as the eastern coast region, and consists of a narrow belt of fairly good grazing lands, extending along the coast from the Strait of Magellan to the Port of Desire. All the available land is here taken up by sheep farmers, mostly from the Falkland Islands and Scotland, and native Argentinians and Chileses. The second region consists of almost barren high pampas and usually equally barren river valleys. It extends from the western border of the first region to the base of the Cordilleras, and is entirely uninhabited, so that while the vegetation is indeed exceedingly scanty it nevertheless suffices for the support of considerable bands of the guanaco and the rhea, the so-called ostrich of South America. The third region is that of the Cordilleras, and is far richer than the other two, both as to species and in the total amount of vegetation.

J. B. HATCHER. *National Geographic Magazine*, 1897.

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Tierra del Fuego

Tierra del Fuego, in a narrower sense, has an area of nearly 20,000 square miles (two-thirds that of Scotland), and consists topographically of two distinct zones, viz. a woodless table-land in the north and a mountainous territory in the south, the latter being the extreme continuation of the South American Cordilleras. Each of these zones consists of two elevated regions, divided by

deep valleys, but, as described below, of very different characters. The boundary between the two zones is an almost straight line that crosses the western channels in lat. $53^{\circ} 43' S.$, and reaches the Atlantic in lat. $54^{\circ} 30' S.$ South of this line flat country is to be found practically only in the river valleys, that rarely reach a width of more than one or two miles. The rest of the land-surface is occupied by a mountain chain formed mainly of folded schists. Massive rocks are very subsidiary, but where they are found they generally stand out conspicuously in the topography—as, for instance, Mount Sarmiento, the most striking and probably the highest summit in the archipelago. With such exceptions, however, the country has a peculiarly monotonous aspect, resembling, one might say, a high wall with a few not very prominent rounded summits, and here and there a narrow cleft. It is only in the attempt to cross the mountain chain that the traveller finds how wrong such an impression in reality is. He climbs the mountains, first their lower parts, covered with luxuriant vegetation, then the more elevated slopes, from about 2500 feet upwards, bare or covered with enormous masses of loose stones and with patches of eternal snow, until he reaches the highest parts and expects to find, as in most other countries, a comparatively level plain where he can walk on for miles without either descending or ascending. But I have never come upon such plains in those regions. The usual thing is rather to find one's self on a narrow ridge steeply descending into a deep narrow valley of almost level surface, through which a deep river, whose waters are white with suspended glacier mud, slowly trickles in complicated windings. On the other side of the valley another steep wall ascends, covered lower down with forest. In a distance of 10 miles it may often be necessary to go down and up in this way some 3000 feet some three times or more; and considering the difficulty of traversing the forests, whether it may be through the full-grown ones in the valleys or the dense shrubs on the upper slopes, it is very evident

that travelling in the Fuegian Cordilleras is not an easy undertaking.

Dr. O. NORDENSKJÖLD.—*Scottish Geographical Magazine*, August 1897.

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The Falkland Islands

Exposed to the unbroken sweep of the stormy westerly winds of the South Atlantic Ocean, with rain falling on more than two-thirds of all the days in the year, and with climatic conditions so unfavourable to agriculture that practically nothing can be cultivated, the Falkland Islands would seem at first thought to be singularly unfitted for human habitation, and likely to be willingly abandoned by man to the myriads of sea-fowl and great flocks of penguins that frequent those rocky shores. Yet here, on these distant islands, has for years lived a happy and prosperous community, and many a good ship which has been worsted in the struggle to round Cape Horn in the teeth of the westerly gales has found Stanley Harbour a welcome haven, and hundreds of sailors have there been provided with the food and water they so often sorely needed.

The Falkland group consists of two larger islands, East and West Falkland, and a considerable number of much smaller ones, only a few of which are inhabited, besides a great confusion of surrounding rocks and reefs.

The first day of the voyage furnished as fine an example as could be desired of typical "Horse Latitude" weather.

On 29th July, the fourth day out from Montevideo, the sky was overcast and the wind south-east, while the temperature fell steadily. On the morning of this day the Falkland Islands were sighted, and for two hours the steamer sailed along quite near the shore. The general appearance of the islands as seen from the sea is wild and desolate. A rugged coast with the sea breaking against the cliffs and rushing wildly among the outlying rocky

islets; inland, some yellowish-brown fields, rising towards uplands broken here and there by whitish masses of quartzite; the whole outlined against a grey confused sky—that was the picture which presented itself to the eye.

The steamer anchored off Port Stanley early in the afternoon. The shipping at anchor was at once an interesting and a pathetic sight. There were two sailing vessels—a German barque and an Italian ship—in good order and ready to sail, but the remaining ones told a silent story of fierce struggles with sea and storm. Several old hulks were lying there, long ago abandoned to their fate.

The town of Port Stanley lies on the southern shore of the bay on a long slope, and is thus partially sheltered from the violent southerly winds. It has at present about one thousand inhabitants, nearly all being English or Scotch. There are three schools, three churches, several inns, a post-office, the Government House, and a few other public buildings. The houses are low-storied; built of wood or stone, and painted white, with coloured roofs. The islanders do their best to counteract the prevailing dull and depressing weather conditions out of doors by providing an abundance of colour and of beauty indoors, and there is scarcely a window in any house in Port Stanley which is not filled with many varieties of potted plants, whose flowers go far towards providing the brightness and cheer which the dull skies do not furnish.

The one fact which is impressed upon the visitor to the Falklands during every moment of his stay is the stormy character of the climate. Situated as they are far out in the ocean, they are exposed to the sweep of the stormy westerly winds, and Fitzroy was not far wrong when he said, "A region more exposed to storm, both in summer and winter, it would be difficult to mention." An old resident of Port Stanley told the writer that when the sun shines for an hour everyone says, "What a fine day we are having;" and although this statement is considerably exaggerated, the story serves to emphasise the fact that clouds and not sunshine are the prevailing conditions.

Here, in the heart of the westerlies, the cyclonic control of the weather is predominant, and as one cyclone follows another in quick succession, "settled-weather" is out of the question.

In the climatic conditions of the Falklands we have the key to the occupations of the inhabitants and to the imports and exports of the colony. There are no trees anywhere on the islands, and their absence is one of the first things that strikes a visitor. Undoubtedly the high winds are one of the chief causes, if not the chief cause, in preventing tree growth, and although many attempts have been made to cultivate trees by transplanting them from the mainland, they have failed. In the absence of wood, peat, which is very abundant on the islands, is universally used for fuel, and all the lumber used in house- or ship-building, or for any other purpose, has to be imported. The very small amount of sunshine, the cold, the high winds, and the prevailing dull, damp weather, make agriculture of any kind practically impossible. In fact, it may almost be said that agriculture does not exist in the Falklands. A few vegetables only are grown, and these are of a poor quality. Domestic cattle are kept and meat is cheap, but with the one exception of beef and mutton, and of the few native-grown vegetables and berries, practically everything in the way of food has to be imported.

But the very same conditions which are unfavourable to the growth of crops seem to be peculiarly fitted for sheep-farming, and this is now, and has been for years, the greatest industry of the islands. The sheep originally introduced were largely Cheviots and South Downs, and the descendants of this stock are famous for their heavy fleece, and the excellence of their meat. The Falklands have been peculiarly free from all sheep diseases, and in spite of the apparently unfavourable climatic conditions, the sheep thrive there in a truly remarkable way.

There is little of interest in the fauna and flora of the islands. Seals and penguins are still quite plentiful,

although their former wholesale destruction made it necessary to protect them by law. Rabbits, once very numerous, are now found on only two of the islands. The wild cattle also, which in the early days of the colony abounded everywhere, are now extinct. Fish are abundant in the waters surrounding the islands, but the task of catching them is so difficult on account of the frequent storms and rough weather that they are seldom used for food. Albatrosses, cormorants, and other sea-birds make their nests on the rocky shore. Peat has already been referred to as being abundant. A reed-like grass ("tussock grass"), which grows in thick bunches and is much sought after by sheep and cattle, is still conspicuous along the shores, but is rapidly disappearing. Several varieties of berries, moss, lichen, rushes, etc., are also found. In the water along the coast are great quantities of kelp, which, growing always on a rocky bottom, is regarded by seamen as an infallible sign of the presence of rocks, although the latter may be many fathoms deep. This kelp, which is found in immense quantities around the Falklands, constitutes in some places a natural breakwater, diminishing very materially the energy of the incoming waves. So distinctive of these islands is this gigantic sea-weed that the inhabitants are generally known as "kelpers."

R. DE C. WARD.—*Journal of School Geography*, February 1898.

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VII. THE CORDILLERAN AREA

Colombia

THE branching of the Cordillera into three ranges near the southern frontier of Colombia causes the rivers of this country to follow various directions, instead of the east to west course, which is general all along the western slope of the Andes, from Chile northwards.

The direct effect of this division of the mountain range would be to form valleys running from south to north, parallel to the three chains. But it would appear that the volcanic forces which upheaved the Central Cordillera were more active, or were stronger at certain points, and that the volcanic action was continued for a longer time at other points. Hence we find that the great focus of volcanic force, represented by the volcanoes of Purace, Sotara, etc., produced an upheaval of the country near them, and made a break in the great valley which lay between the Western and Central Andes, and thus caused the river Cauca to flow to the north and the Patia to the south.

Then, again, to the volcanoes of Pasto, Cumbal, Chiles, etc., near Ecuador, is due the upheaval of the vast and elevated table-lands on the southern boundary of Colombia. The northern limit of their action was marked by a great line of fault or fracture near El Castigo, and along this line of fracture the waters of the Patia basin excavated a passage.

for themselves through the old chain of the Andes to the Pacific.

A similar but later development of volcanic force caused the separation of the valleys of the Atrato and San Juan. Directly to the eastward of this group of igneous rocks lies the great volcanic centre of Herveo, Tolima, and Santa Isabel, and there can be no doubt that the valley of the upper Cauca was for some time in the post-tertiary period converted into a lake, owing to the upheaval of the flanks of the volcanoes mentioned. However, their action also produced a fracture parallel to the opposing Western Cordillera, and the waters of the Cauca at last worked their way northwards and now run through one of the grandest ravines imaginable.

To the northward of the Herveo centre we have a repetition of the same development of elevated table-lands which are found round the great volcanic centre of Pasto, but on a larger scale. They extend throughout the principal part of the State of Antioquia, and as far as the junction of the rivers Nechi and Porce.

The state of Antioquia, although it may be generally looked upon as a great table-land, is broken up by some very deep valleys. That of the river Arma is 5000 feet in depth, and marks the line of a great east and west fracture, and the river Porce, which runs in a valley even deeper than the preceding, follows a north and south line.

The general elevation of most of the country in Antioquia is 6000 feet above the sea, and it may be considered as the highlands of this part of Colombia. There is clear evidence that the river Cauca, in keeping open for itself a passage along the western flank of this great mass of eruptive rock, had a great deal of hard work to do. Over a distance of 200 miles it occupies a comparatively narrow valley, excavated by its waters in the sedimentary rocks which were upheaved and broken by the disturbing influences to the eastward. Naturally, therefore, this part of the Cauca valley is comparatively sterile, owing to the

absence of alluvial deposits; but, on the other hand, it exposes grand sections of strata abounding in mineral wealth.

R. B. WHITE. — *Proceedings Royal Geographical Society*, May 1883, p. 249.

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The Magdalena River

The Magdalena River, the one great commercial artery of Colombia, is confined between the central and oriental chains of the Andes, and reaches the sea after a course of 850 miles from south to north. It rises in the Paramo de las Papas, in a small lake, at an elevation of 13,000 feet. It soon leaves the Paramo, and, in a winding course of about 40 miles, descends 6500 feet, by a constant succession of cascades and rapids. Further on, the current ceases to be so impetuous, the incline of the river being more regular, but it is, at times, narrowed by the escarpments of the mountains which close in upon it; and at Pescadero, near Honda, it breaks into a short series of cascades and rapids. It then flows rapidly northward to its junction with the Nare, near which it is only about 410 feet wide, between rocky hill slopes, and is very deep.

The principal affluent of the Magdalena is the Cauca, which, like the parent stream, rises in the Paramo de las Papas. Its course is governed by the central and occidental ranges, between which it flows. Very numerous tributaries increase its volume as it runs north-east to enter the Magdalena. The lower stretch of the river winds through a level, swampy plain; but nearly its whole upper course is a roaring torrent, frequently jammed between mountain spurs, and plunging through gorges, over reefs, boulders, and fragments of rock torn from its precipitous banks.

From 7° N. lat. to the sea the Magdalena has numerous islands, and frequently sends off lateral channels of considerable volume, which, before they again unite into one

main river, envelop long areas of lowlands, forming islands many miles in length and breadth, similar to those of the Orinoco and the Amazon. Occasionally it abandons some of its lateral channels, which become closed for a time, or get choked with rafts of floating trees and tangled vegetation, which, after decaying, are swept away by some great flood, the channel being again restored. Many large lagoons and extensive swamps, flooded to considerable depth in the rainy season, are found inland from the river, and are especially numerous to the east of its course. For a distance of 200 miles, before entering the sea, the Magdalena is a broad and beautiful sheet of water.

COL. G. E. CHURCH.—*Geographical Journal*, April 1901.

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View from a Summit in the Colombian Andes

Due west of Popayan, in the western cordillera, there is a prominent mountain called the Cerro Munchique, which is so situated that it commands a more extensive prospect than any other that I know of.

Standing on this mountain, by simply turning one's self round, one could obtain a view over more than 15,000 square miles of country. The whole of the Central Cordillera, from the frontier of the Ecuador to the confines of the State of Antioquia, with the valleys of the Cauca and the Patia, were visible to the north, east, and south; whilst on turning to the westward the Pacific coast from the Bay of Tumaco to the mouth of the San Juan River seemed spread like a map before us. A more gorgeous panorama cannot well be imagined. The belts of bright-coloured vegetation, marked by the valleys, with their winding rivers and streams, were backed by the great masses of the Cordillera, with their varied tints and snow-capped peaks. On the other hand, the dark-hued vegetation of the virgin forests of the Pacific slopes stretched down to the ocean margin, which, with its

thousand bays and inlets and fringe of foam, which was quite visible, looked like an edging of lace.

R. B. WHITE. — *Proceedings Royal Geographical Society*, May 1883.

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The Plateau and City of Bogotá

A few miles north of the equatorial line, near the boundary between Colombia and Ecuador, the three great Cordilleras of the Andes combine into one dizzy ridge before again spreading out into three distinct ranges. One of these ranges, branching out north-west, passes through the isthmus into Central America; the second, or middle range, continuing almost due northward, reaches its highest point in the peaks of Tolima, some 90 miles from the Colombian capital, and is soon lost in the Caribbean Sea. The third range, turning north-eastward, passes through Venezuela, and terminates in the Atlantic. In the lap of this last-named range, nearly two miles above the sea-level, is the great savana or plateau of Bogotá.

The plateau proper consists of about 2100 square miles of arable land, it being about 70 miles in length by about 30 in width. In shape and general outline it may be compared to a great oval dish, the high circular wall of treeless mountains corresponding to the outer rim. The entire plain is a treeless prairie, but well watered by a number of small fresh-water lakes and numerous running streams. Near the western extremity of the plateau, these various streams are united into one, known as the river Funza, or Bogotá, one of the principal affluents of the upper Magdalena. Just before reaching the edge of the plateau the Funza runs with deep and rapid current, and is finally precipitated over a perpendicular cliff into a deep gorge some 600 feet below. This is the noted falls of Tequendama.

In this favoured region the planting and the harvest

season may be in every month of the year, and two or even three crops may be grown annually on the same ground. July and August are considered the most inclement and disagreeable months. Dense fogs from the hot valleys below are wafted over the bleak serras, often obscuring the sun for days, or falling in light cold mists.

The rainy season proper—*invierno*, winter, as it is called—sets in about 20th September and lasts until about 20th November. During this time there is invariably a rain-storm daily, but it never rains longer than about twelve hours at a time, and a clear bright morning may generally be counted upon. At mid-day a thunder-cloud will rise and the downpour begins. This will continue incessantly until about midnight, when it suddenly ceases, and the sky becomes singularly clear.

The dry season—the *verano*, or summer—begins about 20th November and continues unbroken until about the middle of February. During this time the climate is simply perfect. Not a speck of cloud is to be seen, and the atmosphere is singularly clear, pure, and transparent. At night the stars shine out against the deep blue sky with uncommon brilliancy, and seem at least a third larger than when seen in clear weather from the lower valleys or from the coast.

The city is beautifully situated on the extreme eastern limit of the great savana at the base of two high peaks of the Central Cordillera, which reaches up to just below the perpetual snow limit. From these peaks, known as Guadeloupe and Moncerrate, we get a very fair view of the interior of the republic. The snow-capped mountains of Tolima and San Ruiz lie some 90 miles to the westward, their great frozen sides glittering under the rays of a tropical sun. Far northwards are the fertile valleys and table-lands of Santander and Boyacá. To the eastward are the rich mining districts of Antioquia, and southward the high ridges which limit the great llanos of San Martin in the valley of the Meta, one of the principal affluents of the great Orinoco.

The streets of the city run eastward up the acclivity to a wide avenue cut in the side of the mountain, and are crossed at right angles by those running north and south. The blocks or squares thus formed rise one above another like the benches of a great amphitheatre, the terraced sierra above and the overshadowing peaks of Guadeloupe and Moncerrate corresponding to the lobbies and balconies. In the middle of each street extending up the acclivity is a rapidly running stream of water, supplied from sources far up in the crevices of the mountain. On the crests of the peaks of Guadeloupe and Moncerrate are two massive cathedrals, visible from nearly all points on the opposite side of the plain.

W. L. SCRUGGS, — *Colombian and Venezuelan Republics*. Sampson Low. 1900.

By permission of Messrs. Sampson Low.

Sierra Nevada of Santa Marta

The Magdalena State occupies the north-east corner of the Colombian republic, and is in fact a triangular wedge between the Andes and the Magdalena River, with the Caribbean Sea as a base. It boasts two distinct mountain systems, the one an eastern ramification of the Andes, which runs the whole length of the State (separating it from the neighbouring republic of Venezuela), and at last disappears at the Goajira peninsula, not entering it, as shown on many maps. The other is the Sierra Nevada of Santa Marta, running due east and west, parallel with the coast-line, and known at the time of its discovery as the Sierra Tairona.

The Sierra Nevada is not only completely isolated from the Andes by two large rivers,—the Rio Rancheria, flowing into the Caribbean Sea, and the Rio Cesar, a large affluent of the Magdalena,—but is of a distinct geological formation. Its physical properties are also very different, its surface presenting chiefly a wilderness of steep grass-covered hills

and rugged peaks. Although capped by eternal snow, with its accompanying abundance of streams and rivers, forest vegetation on its slopes rarely passes the limit of 5000 feet above sea-level; whereas on the flanks of the Andes, across the valley of the Rio Cesar, dense impenetrable forests ascend to the very summit, which at Villanueva is between 10,000 and 12,000 feet above sea-level. The height of the Sierra Nevada has been strangely misrepresented. A good deal of the supposed snow seen from seawards is only reflected light from micaceous granite.

The most picturesque view of the Nevada is certainly from the sea. I shall never forget the first glimpse I caught of it while crossing from Curaçao to Rio Hacha in a Dutch schooner. A glorious tropical sunset had tinged the fantastical line of snowy needles a delicate rose colour, while lower down the many interesting ramifications stood out distinctly in a fine glow of purple on a dark blue base. The scenery of the Sierra Nevada is excessively grand, but it is too desolate, too barren, to be really beautiful; even the loveliest flowers, at this time of year so abundant, appear small and insignificant, and are entirely lost amid the general desolation.

I was enabled last year definitely to determine the exact height of the Sierra Nevada. We made our way up one of the numerous valleys, which all run north and south at right angles to the central or snowy range; these again are cut by the river Cataca and two of its affluents, which flow parallel to the snowy peaks. Five hours of rather dangerous riding along mountain ridges and the banks of deep blue lakes brought us into a sort of cul-de-sac, where all further progress on horseback was stopped by perpendicular masses of rock. An observation taken here showed the boiling-point of water 188.1° , or 13,000 feet. Singling out a promising-looking crevice in the rock, we managed, after sundry gymnastic performances which reminded me very much of wriggling up a somewhat narrow chimney, to reach the foot of a large field of

frozen snow, the long-sought-for goal of my former journeys. What hitherto appeared as terraces and fields of hard smooth snow most inviting to the eye now became a tumbled-up, heterogeneous mass of frozen snow and ice, with frightful precipices, bridges, caverns full of brilliant icicles, and all the other splendours and charms that make glacier travelling so enticing and dangerous. Each step had to be cut in the soft yielding snow and well stamped down to secure a footing. After many futile attempts I reached a small sheltered spot right in under a projecting rock, the foot of the highest peak. Here all further progress was barred by the nature of the rock, and I discovered, to my great mortification, as far as the dense white clouds would permit, that although near to the summit, the last bit of rising ground was inaccessible. The view, obscured by mists at this time of the year, must at other seasons be truly magnificent; but nearly blinded with the snow reflection and enveloped in a dense white fog, I could scarcely see a couple of feet ahead, and with the bitter cold, besides being wet through with snow-digging and frequent involuntary tumbles, managed with difficulty to take an observation. The temperature of boiling water proved to be 181.2° Fahr.; we were therefore nearly 17,000 feet above the sea.

I was now far above the general chain of snow-fields and minor peaks, and allowing at the most 500 feet for the rock and patch of snow that still separated me from the summit, would give a maximum height of 17,500 feet for the Sierra Nevada of Santa Marta.

As may be easily imagined from a range capped with eternal snow, the Sierra Nevada gives birth to innumerable rivers. Few states in the world can boast such a natural or more easily applied irrigation, and few tropical countries have such a supply of ice-cold water laid on to their very doors as the seething hot valley of Dupar and the towns along the Cienaga to Santa Marta. This water system may easily be divided into three distinct sections: 1st, the Rio Cesar with its tributaries; 2nd, the Rio Rancheria

and others, falling into the Caribbean Sea ; and 3rd, the two large rivers that form the Grand Cienaga.

F. A. A. SIMONS.—*Proceedings of the Royal Geographical Society*, December 1881.

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Ecuador

Notwithstanding its equatorial position and a temperate climate subject to little fluctuation, almost every variety of climate may be found in Ecuador, owing to the unequal elevation of the land, and the soil in different localities being of entirely distinct character. We find almost every description of fauna and flora, from the lichen and condor of the snowy crag to the richest tropical palm forest and the macaw ; from the clear, temperate slopes of the strawberry and the llama to the heavy, moist home of the plantain and the alligator ; from the highland desert of volcanic sand to the lowland savana with its browsing cattle.

The great range of the Andes enters Ecuador from the south, divided into two more or less defined chains, with a high table-land or valley between, and assumes here its grandest and most imposing forms. These two ranges, which separate the waters flowing to the Pacific from the more important rivers which contribute their waters to the Atlantic, contain in less than 300 miles of length over twenty mountains and a much larger number of peaks, reaching an elevation greater than 15,000 feet above sea-level, and consequently eternally snow-capped.

Here are volcanoes and volcanic productions in every stage. Immense plains of volcanic sand ; rocks and vales of tuff and scorice—in some of the lower strata are embedded numerous animal remains of the quaternary period ; streams of lava ; fields of punice and the great cones themselves, some extinct, others smoking and dormant, and one, the Sangai, in unceasing activity, all ready

periodically to break out and again devastate the country around them, as they have so often done before. On the western lowlands, intermingled with the artificial clearings for the cultivation of cocoa, cotton, sugar-cane, fruits, and pasture,—in the forests and along the river-banks,—we find natural savanas. In the dry season, from about June to January, all is bare and barren, owing to the total want of rain, with the exception of some half a dozen showers falling generally about October. In a circumscribed locality, though, north of the Peruvian desert, hardly a dry day is known in the year.

On the eastern slope, however, all this is changed. The rainy season may be said practically to last from the commencement to the end of the year, and the natives say as in Colon, "It rains here thirteen months in the year." The heaviest rainfall, with snow and thaws on the mountains, and the consequent flooding of the rivers, occurs from about March to April.

Here no savanas, or open plains, are to be found ; all is covered by the same dense, impenetrable forest, where the vegetable kingdom truly lives a life of struggle for existence, the fittest living and thriving upon the death and decay of the weaker and decrepit. Here the trade-winds which blow up the great Amazon valley, laden with the moisture of the Atlantic, are continually discharging the same upon the slope of the giant wall which arrests their advance, and though at exceptional times rain may not fall for two or three weeks, the soil and all the lower vegetation are scarcely the less saturated, for the sun can never penetrate and cheer the gloom of the green canopy nature has placed over them.

. A. SIMSON,—*Travels in the Wilds of Ecuador.* Sampson Low.

By permission of Messrs. Sampson Low.

Andes of Ecuador

From a geographical point of view the country may be regarded as divided into three territories—namely (1), all the land on the Pacific side of the Andes; (2) the high, mountainous land of the interior; and (3) the less high land on the east of the second section, containing the head-waters of some of the tributaries of the Amazons.

The land on the Pacific side in the neighbourhood of Guayaquil, and some distance north and south, is extremely flat, and is of the nature of a delta, with numerous rivers and natural canals interlacing one another in such a way as to render it difficult to follow out any one in particular. When you quit this flat, outlying land, you find the slopes of the Andes rise without intermission, very steeply; and the abrupt manner in which the mountains begin to ascend from the flat land of the western region is not less noticeable than the extraordinary steepness of the slopes facing the Pacific. Dense and unpenetrated, if not impenetrable, vegetation covers the Pacific slopes up to the very crest of the ridge; giant trees rising straight upward mast-like for hundreds of feet, festooned with parasitic creepers, and enveloped at the base with a mass of tangled undergrowth, shut out the light and limit the view to a few yards on either side.

Before arriving at the main ridge of the Andes, which culminates in Chimborazo, you pass over another and less important range, which forms the western boundaries of the basin of the river Chimbo.

Still proceeding towards the east, you next see, on the opposite of the Chimbo, the range which in this latitude is the principal range of the Andes. South of Chimborazo, and as far as I have seen it, it has an average elevation of 15,000 feet, and contains a number of small peaks, none much higher than the others. Passes across it are not numerous. The lowest of them is perhaps that by which

we descended on to the point called the Bridge of Chimbo, on our return, and this is a little under 12,000 feet above the sea. Next, to the north, the pass which is most frequently used is that by which the road to Quito goes over the great sandy plain called the *arenal grande*, which is somewhat more than 14,000 feet above the level of the sea. Then, continuing to the north, comes Chimborazo, the highest of all the Andes of the Equator, separated on its northern side by a depression called Abraspungo, from the mountain Carihuairazo—a mountain with several peaks, the highest not much short of 17,000 feet, resembling the Blumlis Alp in Switzerland, but planned on a grander scale. North of Carihuairazo this range sinks abruptly towards the basin of Ambato, which town, 8600 feet above the sea, enjoys a mild and agreeable climate. No mountains of prominence are seen to the west of it, and for 30 miles to the north there is nothing of great importance.

You then arrive at Illiniza, rising above 17,000 feet, and in the next 35 miles to the north, almost in a line with the last-named, come Corazon, Atacatzo, and Pichincha. These are isolated mountains—connected, it is true, though not forming an uninterrupted range. The depressions between these are never so low as 10,000 feet; but on the north of Pichincha there is again a break in the continuity of the range made by the river Guallabamba. On the other side of this river the slopes of Mojanda commence to rise, and this mountain, though not touching the snow-line, covers, I believe, more ground than any other mountain in Ecuador, its slopes extending on its eastern side as far as the village of Cayambe. North of Mojanda you have the two considerable mountains Imbabura and Cotacachi, then there is the basin of Ibarra, scarcely more than 7000 feet above the sea, and still farther to the north the elevation of the country appears to increase.

Turning now to the south, we have first the great mountain Cayambe, covered with 5000 feet of snow and

glacier, with the Equator just touching it. To its south-west there is a large glacier-bearing mountain called Sara-ureu, but then for a long distance to the south there is nothing very imposing until you arrive at Antisana, though the general elevation of the land is great—perhaps more than 13,000 feet. Antisana covers an immense extent of country, and has about the same amount of snow and glacier as Cayambe. To its south, so far as I could see, the mountains are small, and you have to return to the west for those of importance. Pasochoa and Ruminahui are comparatively diminutive, their apparent rank being more due to the steepness with which they rise than to their absolute elevation; but Sincholagua is a fine peak of thoroughly Alpine character, with a summit as sharp as almost any of the Chamounix aiguilles. Nearly due south of it is Cotopaxi, the second height of all the Andes of the Equator, and then you have again a long stretch of country containing nothing striking until you come to Tunguragua, a snow-clad summit over 16,000 feet, of very regular shape. South of this lies the basin of Riobamba, bordered on its east by Altar, an extinct volcano, whose crater round three-fourths of a circle represents some of the grandest pinnacles that can be seen in the world, the highest of the whole being not unlike the appearance which would be presented if the famous Aiguille de Dru were perched on the top of the Eiger. Still farther to the south the country is again of moderate elevation, and the one great peak visible—the active volcano Sangai, which is not much inferior in height to Altar—lies away to the south-east.

Passing now to the third territorial division,—the country to the east of the Great Andes,—we find there is still more to be learned. There is a route a little to the north of Antisana, through the village of Papallacta, not unfrequently traversed, which has been known for more than three centuries, and which, if not the exact route taken by the first discoverer of the Amazons, is something

very like it; and there are one or two other routes more to the south, which have been less frequently followed; but the country between them is completely unknown to geographers. I had some hopes that from the summits of the most eastern of the Great Andes we should have been able to gain some information about it. These hopes were not realised.

E. WHYMPEL.—*Proceedings of the Royal Geographical Society*, August 1881.

For another account, see Colonel Church, *Geographical Journal* April 1901.

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Active Volcanoes of Ecuador

There are now only two volcanoes in Ecuador possessing such a degree of life as entitles them to be considered active ones, though there are two others—namely, Tunguragua and Pichincha—which are frequently classed as such, and are anyhow not entirely extinct. I saw the summit of Tunguragua quite clear of cloud several times whilst in the neighbourhood of Ambato, and on no occasion perceived either smoke or steam issuing from it, and the case was the same with Pichincha. But Sangai and Cotopaxi are both fully entitled to be considered active volcanoes, and are seldom at rest. Sangai has been seen but by few persons, either European or Ecuadorian, and I only saw it when we were encamped upon Chimborazo at a height of 17,300 feet, and then only in the early morning. We heard it frequently before this, first of all when we were established at Guaranda, not less than 40 miles away, and its detonations were remarkably sharp and distinct, and were sometimes sufficiently loud to make us start.

Seen from Chimborazo, Sangai presents the appearance of a regular cone, and it is a very fine mountain, though

less stately and symmetrical than Cotapaxi. It has large snow-beds on the upper part of the peak, which die out before its apex is reached, and that is black, and is doubtless formed of slopes of fine volcanic ash. We saw scarcely any smoke issue from it, but at intervals of twenty to thirty minutes there were outrushes of steam, which shot up jet-like with immense rapidity to a height of 4000 or 5000 feet above the edge of the crater, and then spread out into a mushroom-like head, which was gradually drifted away by the wind.

It is curious to state that, although there were no mountains intervening between us and Sangai, we scarcely ever heard any detonations from it whilst we were upon Chimborazo, though at Guaranda, as I have already said, nearly 9000 feet lower, they were sometimes loud enough to startle us. As we were obliged to leave Ecuador at a fixed date, we found ourselves unable to make a journey to Sangai, to examine it more closely.

We were a long time in the neighbourhood of Cotapaxi, and frequently saw it both close at hand and at considerable distances. More or less smoke, mingled with steam, was always issuing from the crater, and this rolled out in a leisurely way, unlike the violence of the eruptions which proceeded from Sangai; in fact, it was difficult to believe that it could be a very dangerous volcano. Yet we ourselves once witnessed at a distance of 65 miles an eruption of ash, which was projected 20,000 feet into the air, and poured out in such a volume that at the distance of 65 miles it produced the effect of twilight soon after mid-day. But Cotapaxi has done far worse than that, and what seems more feared are the floods which generally roll away from it during its greatest eruptions. Ecuadorians, and perhaps others, think that the water proceeds from the interior of the mountain—in short, is erupted. I believe nothing of the kind, and that these floods are the result of the cone becoming unusually hot and liquefying the glaciers which repose on it. For there are glaciers, and considerable ones, upon it, though they are, from being

blackened and obscured by ash, quite imperceptible at a distance.

E. WHYMPER.—*Proceedings of the Royal Geographical Society*, August 1881.

For fuller accounts and magnificent engravings, see Mr. Whymper's *Travels amongst the Great Andes of the Equator*. Murray.

For an ascent of Pichincha, see Vincent *Around and About South America*, pp. 38-40.

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Vegetation of Ecuador

After the first refreshing rains the aspect of the country changes as if by magic; the savanas are covered with an emerald-green carpet of grass and plants, the bushes and trees assume the richest covering of leaves and flowers, animal life wakes up, and it is astonishing what vegetation produces under the influence of the warmth and moisture; by July, most plants have cast off their leaves again. The enormous wealth of water in the many large rivers makes up for the absence of rain in the summer months in the plains bordering them. The zone of evergreen trees, which is identical with that of the cacao, commences in the river system of the Guayas on the Rio Daule, on the main stream (the Rio de Babahoyo), somewhat above Zamborondon, on the Rio Chimbo above Yaguachi. The whole river system of the Rio Guayas may be described as one great paradise. Plantation after plantation, hacienda after hacienda, extend along the main stream; every house is surrounded by magnificent fruit-trees, bananas, and palms. Now we wander for hours through the dark-green cacao forests, now through low coffee bushes, again over bright green fields of rice and sugarcane, or along the steep slopes of darker tobacco fields; suddenly we find ourselves for a short stretch in dense forest, where the monkeys are chattering; then we come

upon thousands of cattle and horses pasturing on the open savanas. These savanas, with their great isolated trees or clumps of bamboo grasses, 20 feet high, present a wonderful sight. The cacao forms the chief wealth of the country. In spite of an extremely primitive system of cultivation, Guayaquil exports on an average 10,000 tons a year. An almost incredible quantity of tropical fruits is shipped weekly on the great Pacific steamers and sailing vessels for the Peruvian and Chilian coasts, which are also supplied with timber and the famous bamboo cane (*cana de Guayaquil*) of Ecuador.

DR. T. WOLF.—*Geographical Journal*, February 1893.

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The Aloe in Ecuador

A very useful as well as the most ordinary plant in the valley is the American aloe, or "century plant." It is the largest of all herbs. Not naturally social, it imparts a melancholy character to the landscape as it rises solitary out of the arid plain. Most of the roads are fenced with aloe hedges. While the majority of tropical trees have naked stems with a crown of leaves on the top, the aloe reverses this, and looks like a great chandelier as its tall peduncle, bearing greenish-yellow flowers, rises out of a graceful cluster of long, thick, fleshy leaves. When cultivated, the aloe flowers in much less time than a century; but, exhausted by the efflorescence, it soon dies. Nearly every part serves some purpose: the broad leaves are used by the poorer class instead of paper in writing, or for thatching their huts; sirup flows out of the leaves when tapped, and, as they contain much alkali, a soap (which lathers with salt-water as well as fresh) is also manufactured from them; the flowers make excellent pickles; the flower-stalk is used in building; the pith of the stem is used by barbers for sharpening razors; the fibres of the leaves and the roots are woven into

sandals and sacks; and the sharp spines are used as needles.

JAMES ORTON. — *The Andes and the Amazons*. Copyright. Harper and Brothers, New York.

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Peru

Peru is divided longitudinally into three well-marked regions, which are entirely different from each other. The coast, extending from the base of the maritime Cordillera to the Pacific Ocean, consists of a sandy desert, crossed at intervals by rivers, along the banks of which there are fertile valleys. The *sierra* is the region of the Andes, about 250 miles in width. It contains a stupendous chain of mountains, lofty plains, and table-lands, warm and fertile ravines and valleys. The *sierra* is the native place of the potato, the abode of the alpaca and vicuña, while in its recesses lie concealed the inexhaustible mineral wealth of Peru.

Skirting the eastern slope of the Andes is the third region of tropical forests within the basin of the Amazon, called *montano*, which extends to the eastern frontier. The three belts into which Peru is thus longitudinally divided present totally different aspects from every point of view; the coast being a strip of desert traversed at intervals by narrow fertile valleys; the *sierra* a series of lofty mountain ranges; and the *montano* a vast expanse of dense tropical forest, cut up by great navigable rivers. Some have their origin in the summits of the Andes, and run with a permanent stream into the ocean. Others rising in the outer range receive less moisture and carry on a volume of water to the sea during the rainy season, but for the rest of the year are nearly dry.

SIR CLEMENTS MARKHAM. — *Peru*. Sampson Low.

By permission of Sir Clements Markham and of Messrs. Sampson Low.

The Coast Desert of Peru

The traveller, who follows the course of Pizarro in the steamers of the Pacific, wonders, when he enters the Bay of Paita, whence came the fruit and flowers brought as presents by the aborigines to the vessels of the discoverer. Before him, and all around the bay, rise the naked walls of the Barranca, 300 feet above the beach from base to summit, and as bald as any rock—a brown gray sand, utterly unpromising. Going to the plain above, he beholds only a treeless desert stretching away to the foot-hills of the still more distant Cordillera; no living green thing, no blade of grass, no little shrub, gives rest to the eye, wearied with the dreary waste of sand. For landmarks some ledge of gypsum crosses the trail that leads into the *mesa* towards the towns of the Pinra valley and the Chira; an insignificant eminence, scarcely a hill, too hard baked in the sun to be blown away, forces the traveller to make a detour. Sometimes the skeleton of a mule or horse becomes a monument to mark the otherwise blind trail. Occasionally the traveller enters a belt of *medanos*, crescent-shaped sand-dunes, looking like small detached fortifications of which the material is always aloft in the wind, travelling to leeward in eternal migration. In the early morning air you hear in this desert a peculiar minor music; if there were trees at hand you might think it the sighing of the wind in the branches; then you note flying glassy particles, that roll up the slopes of the *medanos*, and in this attrition you have found the source of the mournful cadence that seems to fill the whole surrounding atmosphere.

Once in five to seven years there comes a marvellous change over all this scene. A shower—sometimes two or three—wanders away from the mountains and is poured over the arid land. Then what wealth of beauty leaps under the wand of nature. The hitherto lifeless earth springs into being; grass and flowering plants appear on every hand, grown to the height of a horse's head.

Whence comes all this brilliant life? How has it slept in the ground during these years? It lasts a week, and has been known to live nearly a month; cattle and great herds of goats wander out of the inundated valleys across the living field, and revel in the boundless joy. When they return, we know the beauty is departing and death is settling on the scene.

A. F. SEARS.—*Journal of the American Geographical Society*, 1895.

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The Andes of Peru

In the region of the Cordillera of the Andes, in Northern and Central Peru, the country is broken up into deep warm valleys and profound ravines, separated by lofty precipitous ridges and snowy peaks, which combine to form some of the most magnificent scenery in the world. Vast flocks of sheep and alpacas find pasture in the upland slopes, while abundance of wheat is grown lower down. Indian corn generally flourishes at a still lower elevation, though it is grown as high as 13,000 feet on the islands of Lake Titicaca, and sugar-cane is cultivated in the deep valleys. This is the nature of the country between Ayacucho and Cuzco, and in the valley of Vilcamayu, which extends from the foot of the Vilcanota range until it subsides into the vast tropical plains to the north and east of Cuzco. But the southern part of the interior of Peru and the northern portion of Bolivia present a very different character. From the Vilcanota Mountains the Andes separate into two distinct chains, namely, the Cordillera or coast range, and the Eastern Andes, which include the loftiest peaks in South America, Illimani and Sorato, or Illampu. The region between these two ranges contains the great lake of Titicaca, and consists of elevated plains intersected by rivers flowing into the lake, at a height never less than 12,000 feet above the sea. The magnificent scenery of Northern and Central Peru is

wanting in this southern part of the country, usually called the Collao. It, however, possesses features of its own which are at once striking and imposing, while the land which is drained by the lake of Titicaca was the cradle of the civilisation of the Incas.

The rainy season of the Cordilleras commences in November, and continues until the end of March, and during most of that time the discomfort of travelling is so great, and the rivers are so swollen, that a journey is seldom undertaken by an ordinary traveller. In March, however, the rain does not fall continuously or in any quantity. The early morning is generally clear, but in the afternoon mists, rain, or snow begin to fall, and continue until far into the night. From April until October is the dry season, and in May, June, July, and August a cloud is scarcely ever seen in the sky.

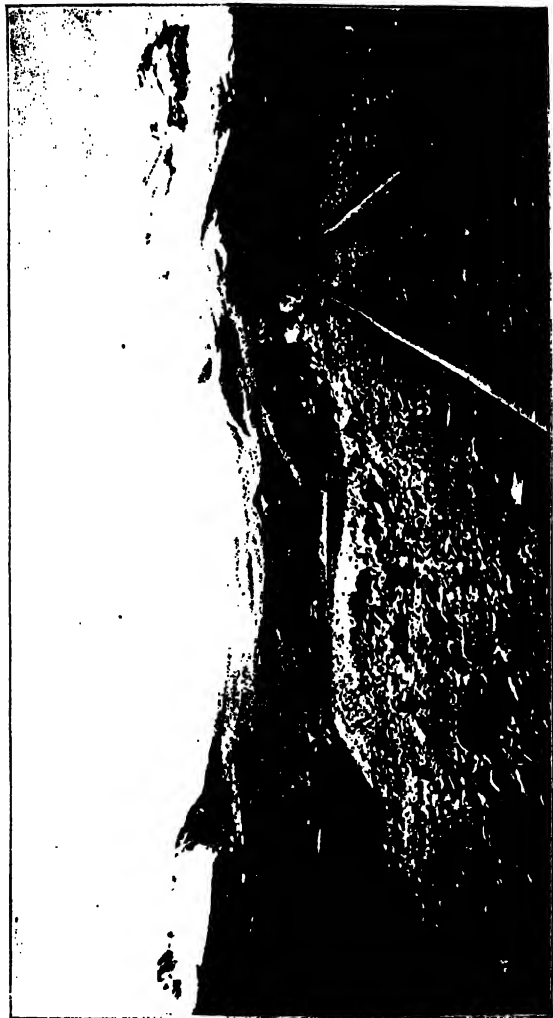
SIR CLEMENTS MARKHAM. . . *Travels in Peru and India.* Murray.

By permission of Sir Clements Markham and of Mr. John Murray.

The Animals of Peru

The animals which specially belong to the Peruvian *sierra* are the domestic llamas and alpacas, and the wild vicuñas.

The llama stands about 4 feet 6 or 8 inches, and the colours of the flocks vary much—generally brown with shades of yellow and black, frequently speckled, and more rarely white or black. The males are trained to carry burdens, while the females are kept in pastures. They will carry about 100 lbs., but when a llama finds the load too heavy it lies down, and no power on earth will move it until a part is taken off. The daily journeys do not exceed three or four leagues, because the animals will not feed during the night, and they must be allowed to graze during the march. When resting the llamas make a humming noise which sounds like a number of *Æolian* harps. A flock of laden llamas going over the mountains



From Conway's "Bolivian Andes."

THE ANDES. SUMMIT OF THE OROYA RAILWAY.

is a strange and beautiful sight. They proceed at a slow and measured pace, with their long necks erect, and gazing eagerly on every side, and their Indian masters treat them with affectionate kindness. The wool is used for making coarse cloth.



LLAMA.

The alpaca is smaller, but standing only about 3 feet 3 inches, and to the shoulders $2\frac{1}{2}$ feet. The fleece is beautifully soft and very long, either white or black, and the animals are tended with great care, being kept in large flocks.

The largest animal of the llama kind is the huanacu, which, however, is more common in Chile and Patagonia.

The vicuña is generally met with on the lofty regions and table-lands of the Peruvian *sierra* in a wild state, and it is by far the most beautiful and graceful of the genus. The neck is longer and more slender, and its short, curly wool is finer and more silky. The head, back of the neck, and back are of a peculiar reddish-yellow hue, the inner



VICUÑA (HEAD).

parts of the limbs a bright ochre, and the breast and belly are white. Vicuñas live in flocks of six to fifteen females and one male, which keeps guard at a little distance while the others are grazing. They frequent the grassy expanses and patches at great heights, and are often to be seen with their backs covered with snow.

SIR CLEMENTS MARKHAM.—*Peru*. Sampson Low, 1880.

By permission of Sir Clements Markham and of Messrs. Sampson Low.

Lima

On a cold, foggy morning we cast anchor before Callao, the port of call for Lima. Callao has a large seafaring population of some 25,000 inhabitants, but it is a dirty, unwholesome-looking town. The train soon bore us along

the 8 miles that separate the capital from the port. Although within the rainless zone, the valley of the Rimac, in which lies Lima, is not without a certain vegetation—dusty, brown, and burnt-up, it is true, and obtained by industrious irrigation. The fields were surrounded by walls of *adobe*, laid in enormous blocks, and the road following the line was inches deep in dirt.

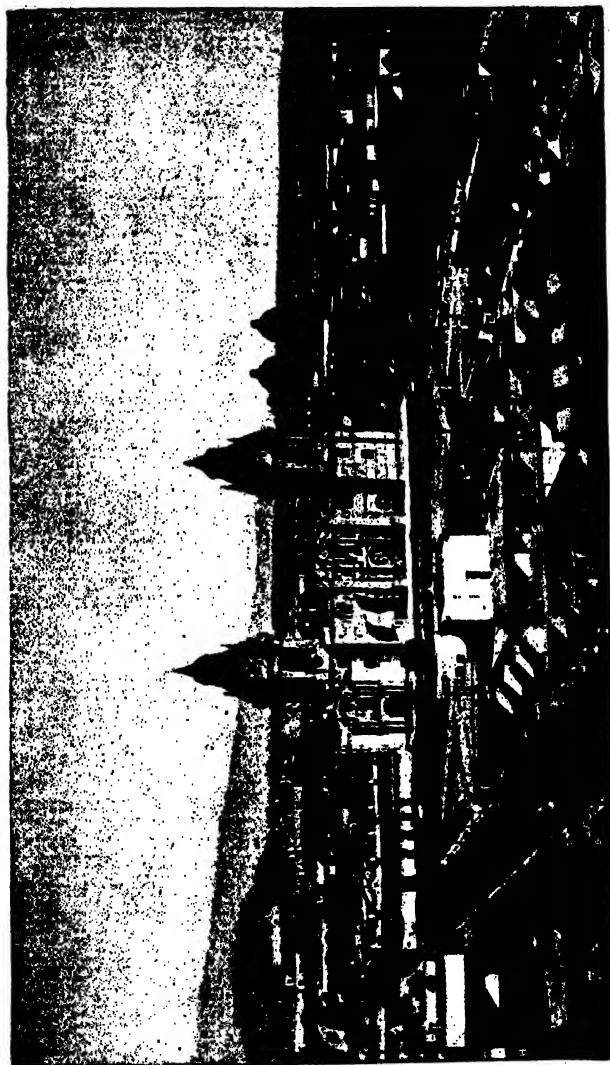
The glamour of ancient days lingers round Lima, but the illusion disappears only too quickly with a glimpse of the Spanish capital, its narrow streets paved with round cobble-stones, its shops full of second-rate French goods, its numerous stucco churches, gaudy with coloured plaster and florid carvings. The only curious feature of domestic architecture is the covered wooden balconies projecting over the street from the second storey of the houses. From this seclusion, seeing yet not seen, the Spanish ladies watch the life in the street below.

The only attraction of Lima is found in the Cathedral Plaza. Here the Gothic cathedral, with its façade of innumerable pillars and carved figures of saints, stands raised on a wide platform. Deeply mellow are the sonorous tollings from the great bronze bells hung in either tower.

A drive round Lima shows how small is the city, every transverse street revealing the mountains at their extremity and the peaked foot-hills that fill the plain round the city. Wherever you look in Lima it is *adobe*, the mud-brick of the country. Plastered over, it presents the appearance of a whitewashed wall left in its natural state. Of the same material are constructed those tawdry and startlingly-coloured fronts of the churches, hideous in rococo decoration and carved figures. The interiors, with their velveteen hangings, glass chandeliers, and gaudy paper flowers, are worthy of the exterior.

LADY VINCENT.—*From China to Peru.* Sampson Low.

By permission of Messrs. Sampson Low.



LINA CATHEDRAL

Cerro de Pasco

Cerro de Pasco is a town of 6000 or 8000 inhabitants, engaged chiefly in silver mining and trading. It is on the Pampa at an altitude of 14,200 feet, where one of the most extensive and richest silver-mines known has been worked for generations by the Spaniards and Indians. The direction of the plain is from south-east to north-west. Some idea of the mineral wealth of these mines may be formed from the fact that during the occupation of the Spanish up to 1803 the immense amount of £61,860,320 was realised from their working. And though the industry has greatly fallen off, there still is a large quantity of silver produced monthly, which will be very largely augmented when certain measures which are in contemplation affecting the drainage of the mines shall have been completed. In the vicinity are also veins of coal, almost at the surface and in considerable quantity. The climate is raw and cold, but not unhealthy. Snow, mists, and rain or sleet are frequent.

Leaving Cerro de Pasco, the road leads almost immediately down a wild and narrow gorge beside the tiny rivulet, whose source, a spring, is pointed out just where the descent begins. It is the Huallaga, one of the great affluents of the Amazons. As it descends, the stream speedily increases in volume, tearing and tumbling along its rocky bed almost all the way, between mountains whose sides, so high and precipitous are they, barely show the landslips, measuring from 100 feet upwards, which have occurred on the river-banks.

A. RONS.—*Proceedings of the Royal Geographical Society*, June 1892.
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The Road to Bolivia

(a) *From Mollendo to Arequipa*

It was my good fortune to be the first traveller to go by rail from the Pacific to Lake Titicaca, and I propose to

give a sketch of this unique journey. The western terminus is Mollendo, just south of Islay, a sudden creation of the railway. Before it is the unbroken ocean, behind it is a perfect desert. Leaving the elegant station, which stands within sight and sound of the sea, the train, carrying about 100 passengers, rolled down the coast, and then turned north-easterly to climb the barren hills in zigzag fashion. Parallel to the track lies the longest iron aqueduct in the world—an 8-inch pipe, 85 miles in length, winding down the mountain, to supply Mollendo with fresh water from an altitude of 7000 feet. Still ascending, clinging to the sides of the mountains, and tacking on almost parallel tracks, we caught occasional glimpses of the magnificent sea, but of only one green thing in all the landscape—the cultivated valley of Tanbo. The train stopped for breakfast at Cachendo, on the western edge of the Great Desert of Islay. Across this hot and level pampa the train took a straight line with great speed, raising a cloud of dust.

Nothing breaks the monotony but now and then a mirage, here and there a sand-dune, and the roughest kind of metamorphic hills in the distance, covered with a sheet of white volcanic dust; for the surface of this sea of sand is really as restless as the ocean. There is scarcely a trace of vegetation, save here and there an ashy, gaunt-looking cactus; yet around the leaky railway water-tanks the grass grows luxuriantly.

The first relief was a procession of snow-clad mountains along the eastern horizon, whose summits stood from 18,000 to 20,000 feet above the Pacific. Within sight of these towering peaks, we flew along the edge of dizzy embankments, passed the iron baths of Tingo, and suddenly entered the city of Arequipa, 107 miles, or eight hours, from Mollendo. Arequipa—"the place of rest," as the name signifies—is one of those bright spots so often seen in the Andes, all the more charming from contrast with the savage character of the scenery around it. On the white hills around, powdered with volcanic dust, grow

solitary tufts of gray cactus; but in the watered valley stands the smiling city, surrounded by numerous villages and farm-houses, and fields of grain, clover, and potato, bordered with tall willows. The valley is 10 miles long by 5 miles wide. Just behind the city, and in threatening attitude, stands the beautiful and, fortunately, now silent volcano of Misti. Nothing can be more picturesque than the view of this mountain from the Grand Plaza, as its snowy dome reflects the morning sun. Scarcely any spot in Peru is more noted for earthquakes.

J. ORTON.—*The Andes and the Amazons*. Copyright. Harper and Brothers, New York.

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(b) *From Arequipa to Lake Titicaca*

Passenger trains leave Arequipa for Lake Titicaca on Thursdays and Sundays at seven o'clock in the morning. Freight trains run every day. The track climbs round the base of the volcano Misti. The mountains are bare, and seem to be composed of alternate layers of rock and baked clay. The latter looks like chalk and cuts like cheese. It was very convenient and useful for grading purposes, and on the mountain sides are great cavities which were shovelled out for this purpose, whose walls are as regular and as smooth as if they had been done with a carving knife. At intervals of a few miles are lovely valleys, showing where the water has been gathered and utilised for irrigation, for the soil is rich and produces in a most prolific manner anything that can be planted. Sugar-cane and wheat grow side by side, cotton and corn mingle their foliage, and potatoes and melons and ordinary vegetables and fruits grow as they do in California.

Before the railway was built it was a journey of thirty days from Cuzco across the desert to Bolivia, and even now some people prefer to go that way. Thousands of burros and llamas are still engaged in competition with the railways, transporting ores, wool, hides, and carrying back

into the mountains, cotton goods, hardware, and other merchandise.

The *arrerios* are usually accompanied by their entire families, and as their lives are spent coming and going across the burning sands of the desert, it is a matter of indifference how long the journey lasts. The animals are the capital of the *arrerio*. The desert is his home. His wife helps in the driving, and sleeps by his side on the sand. They have no shelter, but wrap their ponchos around them and lie down to pleasant dreams with their bare feet and legs exposed, while ice forms in little streams around them. As the camel to the people of the deserts of Asia, so is the llama to those who dwell in the Andes—a faithful and enduring beast, without which they would be helpless; for mules and horses cannot endure the rarefied atmosphere. When a horse is first brought into the high altitudes of the Andes the blood drips from his mouth, ears, and nose. Mules are more enduring, and burros are better still, but the llama is native to the snow-clad peaks, and thrives best where other animals find existence impossible.

We cross the grand divide at Crucero Alto (The High Cross), a collection of *adobe* huts and a well-built station, upon the front of which is an inscription to inform the traveller that it is the highest point upon the railway, and 14,666 feet above the sea. The inhabitants are mostly railway men and the families of the shepherds who watch their flocks upon the pampas that surround it.

At Crucero Alto water freezes every night of the year, and the thermometer often falls to 6, 8, and 10 degrees below zero. There are no facilities for artificial heat, not even fireplaces, and people keep themselves warm by putting on ponchos and other extra wraps. At noonday the sun is intensely hot because of the elevation and rarity of the atmosphere, and blisters the flesh of those who are not accustomed to it. There is a difference of 20, and sometimes 30, degrees in the temperature of the shade and the sunshine. Water will freeze in the shade, while

in the sunshine 20 feet away men may be working in their shirt-sleeves.

From Crucero Alto, the highest town in the world, the southern railroad of Peru drops into the Lagunillas, the lake region of the Cordillera, where, 14,250 feet above the sea, is a group of large lakes of very cold, pure water, without inlet or outlet, that receive the drainage of a large area and conceal it somewhere, but there is no visible means of its escape. A fringe of ice forms round the edges of the lakes every night the year round.

After crossing the grand divide at Crucero Alto, you enter the great basin that lies between the two ranges of the Andes, and is known to the natives as Puna, 500 miles in length, and from 20 to 300 miles in width.

On either side this mighty table-land is supported by the buttresses of the Andes and the Cordillera, and the ranges of snow-covered peaks can be seen to the east and to the west from every eminence, a vast chaos of mountains, ranges, and cross-ranges, bleak, barren, and lifeless.

This mysterious region is the most elevated of human habitations excepting Tibet. The latter represents only mountain pastures; but the great Andean basin supports towns and cities, affords food for herds of cattle, llamas, vicuñas, and sheep, and produces annual harvests.

Here, at a mean level of 12,645 feet above the sea, is a lake almost as large as Lake Erie, the highest navigable water, of immeasurable depth. The eastern boundary is formed by the loftiest mountains of the American continent, and the greatest continuous snow range in the world.

A curious phenomena is that metal never rusts in the waters of Lake Titicaca. You can throw in a chain, anchor, or any article of ordinary iron and let it lie for weeks, and when you haul it up it will be as clean and bright as when it came from the foundry; and, what is stranger still, rust that has formed upon metallic objects elsewhere will peel off when immersed in its waters.

The island of Titicaca is now the property of Mr.

Miguel Garces of Puno. A village of 700 or 800 Indians are living in mud huts and raising wheat, barley, and potatoes among the remnants of the earliest culture of America. The island lies a mile or so from the main shore, from which it is separated by a bottomless channel. The nearest port is the little town of Calle. There is no communication except by balsas, the curious craft that are older than history, and were used by the Incas, as they are used by the Indians to-day, for transportation. They are built of barley straw, tied together in bunches and then bound by wisps in the shape of a double or treble gondola.

W. E. CURTIS.—*National Geographic Magazine*, July 1900.

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La Paz

As the journey to La Paz approaches its end, the traveller enjoys a startling surprise. The highway across the plateau leads to the brink of a cañon 1100 feet deep, whose walls are almost perpendicular, and which in colour and topography resembles the Grand Cañon of the Colorado. At the foot of this mighty gorge lies the capital of Bolivia. The first glance shows a vast expanse of red-tiled roofs, occasionally broken by bunches of foliage and graceful spires, and a river tumbling down from the mountains is crossed by picturesque bridges of massive masonry, centuries old.

Rome, you know, sat upon seven hills, and if that is an advantage, La Paz is more notable than the Eternal City, for it covers forty hills and hollows. Two or three of the main streets that lie along the ridges are reasonably level, and wide enough to accommodate the traffic of a population numbering 60,000 or 70,000. There has never been a reliable census. Fine houses of heavy walls of stone or *adobe* are painted in giddy colours—blue, green, pink, purple, or orange—and often embellished with fantastic designs that are very much admired by the

Boliviana, who love gay colour, music, and motion; but most of the streets are narrow and steep, like stairways with side walks, except the *plaza* and the principal trading streets, and paved with small cobble-stones, with the sharp ends up, so as to lessen the danger of slipping in damp weather. The cathedral, which adjoins the Government "palace," where the President resides and the heads of the executive departments have their offices, is an enormous structure, large enough for a city of ten times the size of La Paz. The brick walls, 8 or 10 feet thick, are veneered with dressed stone, and some of the carving is beautiful.

At the elevation of 12,500 feet above the sea, the atmosphere is so rare that breathing is difficult, and people afflicted with heart disease or weak lungs, or a superabundance of flesh, must avoid exertion as much as possible. The veins in your head feel as if they were about to burst. You pant like a tired hound as you climb the steep streets of the city or the stairway of the hotel, and are compelled to stop every few moments to recover your breath. There are sharp pains in the lungs, a drowsiness about the head and eyes, and when you lie down to sleep at night your heart will thump against your ribs like a pile-driver.

W. E. CURTIS.—*National Geographical Magazine*, July 1900.

By permission of the National Geographic Society.

Coasting along Chile and Peru

On the 26th of May 1821 we sailed from Valparaiso and proceeded along the coast to Lima. During the greater part of this voyage the land was in sight, and we had many opportunities of seeing not only the Andes but other interesting features of the country. The sky was sometimes covered by a low dark unbroken cloud, overshadowing the sea and resting on the top of the high cliffs which guard the coast; so that the Andes, and indeed the whole country except the immediate shore, were then screened from our view. But at some places this lofty

range of cliffs was intersected by deep gullies, called *quebradas*, connected with wide valleys stretching far into the interior. At these openings we were admitted to a view of regions which, being beyond the limits of the clouds and therefore exposed to the full blaze of the sun, formed a brilliant contrast to the darkness and gloom in which we were involved. On the 9th of June we sailed from Arica and steered along shore to the north-west. In the evening of that day we had a fine view of the Cordillera, or highest ridge of the mountains, about 100 miles off. It was only indeed when the ship was at a considerable distance from the shore that the higher Andes came in sight; for when nearer, the lower ranges, themselves of great height, intercepted the remote view. But when we stretched off to the distance of 30 or 40 miles these intermediate ranges sunk into insignificance, while the chain of snowy peaks rose in great magnificence behind them. It sometimes even happened that the lower ranges, which had entirely obstructed the view of the Cordillera, when viewed at no great distance from the coast, were actually sunk below the horizon by the curvature of the earth, when the distant ranges were still distinctly in sight and more magnificent than ever.

CAPT. BASIL HALL.—*Extracts from a Journal.* Constable.

Chile

A country claiming more than 2000 miles of length from north to south would be an almost impossible country to handle under ordinary conditions. But there is nothing ordinary about Chile. It is so narrow that it is nowhere difficult to reach, if it were not for the impenetrable forests that cover great areas in the southern regions, and the almost impassable desert of Atacama in the north. Her sons may at the same moment be traversing with parched tongues the lands of the rainless north, and shivering in the vicinity of the great glaciers of Magellanes, or vainly seeking the sun in soaking Valdivia,

or under the ceaseless rain-clouds that sweep across the noble Gulf of Corcovado. No more marvellously varied region than Chile is covered by a single geographical expression. If she is not surrounded by the sea, she is at least unable to get far away from it. The antarctic current that sweeps along her shores brings life of fin and feather to mingle the semi-arctic regions with the semi-tropic. The humming-bird follows the fuchsia down to the Straits of Magellan, and the penguin follows the sardine and the atherina to the Bay of Valparaiso. A narrow strip of territory with a well-traversed sea-board should not be seriously in want of transit, and to a certain extent this is true. But there are some serious disabilities of a physical character not yet overcome. Besides the main Cordillera of the Andes, there is a coast range practically running parallel therewith from Valparaiso to the island of Chiloe in the south, and forming a barrier to ready intercourse landward from the sea. Enclosed between these two ranges is the great rich central valley of Chile, now traversed by the main railway from Santiago to the south, with various minor offshoots accessible to the rail. As yet these two main lines of communication—the sea-coast and the rail—although parallel and at no great distance apart, are strangely out of touch.

This arises from the character of the rivers of the country. For the most part, they are of no great volume. With the exception of the fine river of Valdivia, all the navigable streams have either bad bars or other obstructions. From Valparaiso to Talcahuano—perhaps the finest harbour on the Chilian coast—over some 440 kilometres (274 miles), there is no really good landing for steamers, although smaller boats than the ordinary coasting steamers run the bar of the Rio Maule into the beautiful district of Constitucion. Similar boats run up the river Imperial as far as Carahue; and from Valdivia as a centre the fine river Bueno, worthy of its name, is penetrated up to Trumao, where the completed portion of line to Osorno touches the river-side. An English-owned

branch line from Concepcion to the mines of the company at Curanilahue also touches the coast at Coronel, the Newcastle of Chile, in the Bay of Arauco, protected to an extent by the island of Santa Maria, while the coaling and gold-mining port of Lebu receives a call when weather permits. But over many hundred miles of coast the natural difficulties are great, and intercourse conducted at such risks that several of the small clever little coasting steamers, ably commanded and well handled, disappeared during our stay in the country.

While, therefore, private enterprise is doing its utmost to overcome the natural difficulties of the coast, and local steamers and launches run everywhere in such rivers as Valdivia and Rio Burno, the central railway keeps advancing, already runs regularly and with speed as far as Temuco on the Rio Imperial, and will within a period reckoned by months be completed to the important, but hitherto isolated, town of Osorno, in the south. Hence a further portion of little over 100 kilometres will take it by the beautiful Lake of Llanquihue, already a prosperous German colony, to the thriving and secure terminus of Puerto Montt. Here there are no serious difficulties in the way, but an industrial community awaiting facilities, and ready to take advantage of them.

To the people of Chile, represented by officialdom, until lately Chile might be considered as lying between Valparaiso and Concepcion. Since nitrate of soda has paid the bulk of the taxation, the nitrate lands of the north have received a little more consideration; and the opening up of the frontier has threatened to extend interest to Temuco along the track of the rail. But Chile proper is really the great central valley that runs down between the Andes and the coast range, and interest ceases to a Chilian *caballero* when the climate becomes too wet, and the distance from the capital and its attractions too great.

Chiloe

The archipelago of Chiloe consists of sixty islands lying between $41^{\circ} 40'$ and $43^{\circ} 42'$ S. lat. The ocean has here, as it were, broken through the outer range of the Andes and converted valleys and ravines into straits and bays, the high land forming the islands of Chiloe and its neighbouring groups. Towards the north and east the archipelago approaches the continent, and is separated from it only by the narrow channel of Chaco to the north, and to the east by the gulfs of Ancud and Corcovado. The mean distance from the main island to the continent is between 30 and 50 miles. Towards the south, from the main island to the most northerly of the Guaitecas, the distance is about 25 miles.

The principal island—Chiloe—contains about 3000 acres; it is well wooded and hilly, but the greatest height is not more than 2600 feet.

The climate is healthy, cholera having never reached these islands, and many of the inhabitants live to a great age. Rain is abundant throughout the year, snow is very rare, and the heat is great during the day in summer. November is on the whole the best month to explore the islands.

The prevailing winds are south and west in summer, and north and west in winter. In the south of Chiloe, the easterly winds coming from the mountains cause terrible storms and water-spouts, which are very dangerous to the shipping at anchor in the creeks.

The inhabitants, mostly Indian, or of recent Indian extraction, are gentle, humble, and hospitable; crime is rare, especially since the pirates of the Guaiteca Islands, who pillaged vessels and massacred their crews, have been captured and put to death. According to the census of 1899, the population of the islands numbers 75,500. Long accustomed to national administration, and converted to Christianity under the influence of an energetic



INDIANS OF THE ISLAND OF CHILOE. •

and influential clergy, they carry on their various occupations in peace and prosperity.

The inhabitants are principally employed in agriculture and wood-cutting. Every Chilote is a landowner, if only of a few acres; but from early spring to late summer large numbers of them (from four to five thousand) migrate northwards into the province of Valdivia, to work on the railways, or at the harvest, or in the woods, returning afterwards to their own land. They are a hardy race, possessing great muscular strength, and fearing neither cold nor rain. Always barefoot, both men and women cut wood in the forests even in mid-winter, and they journey as far as the Guaitecas for this purpose. They carry the logs on their backs, unless they are too heavy, in which case bullocks drag them to the nearest creek, where a merchant usually buys the lumber. Generally they get paid in kind, and there is a great difference between the appraised value and that of the goods given in exchange. There as elsewhere, alas! the poor natives are victims of the cupidity of speculators, who offer in barter unrectified alcohols, made from corn and potatoes, which poison both mind and body. Otherwise life is easy for the Chilotes, who have few wants; their fields furnish the potato, their main food; the sea gives abundance of fish and shell-fish; and wood grows almost everywhere. To collect shell-fish the women go down to the beach armed with hooked sticks. Pigs are also trained to hunt for the bivalves, just as they do in Perigord for truffles.

Mrs. L. GROVE.—*Scottish Geographical Magazine*, March 1894.

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Climate and Occupations in Chile

The key to the climatic contrasts which Chile exhibits, between the desert region of Atacama in the north and the abundant rainfall of its southern extremity in Tierra del Fuego, is to be found chiefly in the presence along its

western border of the great mountain chain of the Andes. We find nearly all of South America south of the equator and on the eastern side of the mountains, in the south-east trade-wind region, well-watered. The rainfall naturally decreases from the coast inland, and where the land is low, and far from the ocean, there is but little rain. There are, however, no extended desert areas, as in South Africa and Australia, and as soon as the winds reach the eastern base of the mountain, and are compelled to climb, the rainfall rapidly increases again.

In the trade-wind latitudes on the western or leeward coast we have the dry and barren regions of Peru and Chile. From lat. 4 S. as far down as about lat. 30 S., the western coastal strip is either practically rainless or has only an extremely small rainfall. But south of lat. 30 S., on the west coast, we begin to come into the region of the prevailing westerly winds, and the rainfall at once increases, the increase becoming greater and greater with increasing latitude, until at about lat. 38 S. we enter a zone of heavy rainfall. In these same latitudes on the eastern side of the Cordilleras, however, the rainfall decreases as a whole south of lat. 30 S., and while Southern Chile has more than it needs, the plains on the eastern or "rain-shadow" side of the mountains are largely left dry.

It is to be expected that such great difference in rainfall should exercise an important control over the occupation of the inhabitants, especially over such occupations as are directly connected with agriculture. For where, as in the northern provinces of Chile, there is practically no rainfall, agriculture on a large scale is impossible, and vegetable life can only grow in those restricted localities where irrigation can be resorted to. On the other hand, in the far south, where the abundant rainfall is favourable to the growth of forests, we shall expect to find that lumbering plays an important part in the life of the people. In the region midway between these two extremes, where there is neither an excess nor a deficiency of rainfall, agriculture will naturally be profitable, and

will constitute the chief occupation. Our expectations in these matters we find fully verified. In Southern Chile, up to about lat. 41 S., which includes the region of heaviest rainfall, there are extensive forests as yet hardly attacked by man, and lumbering and fishing are the chief occupations. In Northern Chile, north of lat. 27 S., where the barren nitrate fields replace the green valleys and the vine-clad hills of the more favoured districts farther south, the nitrate industry and mining of various sorts are the chief and almost the sole occupations of the people. Between lat. 27 and 41 S., over most of which region there is sufficient rainfall for the growth of crops, although irrigation is necessary in many parts, comes the agricultural zone proper. In the northern districts of this zone, where the rainfall is very small, mining becomes of importance; and in the southern districts, near the zone of heavy rainfall, lumbering becomes one of the chief occupations. In this agricultural zone, cattle-raising is also an important occupation, large numbers of cattle being shipped to the northern parts, notably Iquique, where the lack of vegetation precludes the raising of herbivorous animals.

R. DE C. WARD.—*Journal of School Geography*, December 1897.

By permission of Professor R. E. Dodge.

The Potato

The potato, known as patata, and more generally in South America as papa, is undoubtedly of Chilian origin. This precious tuber, without which humanity could hardly exist nowadays, grows in the wildest parts of Chile, in the deserts, in the islands; in the Cordillera it is found in such abundance that the Indians have named a whole region after it "Cordillera des Ponis." In times of famine or insurrection they have often resorted to the wild potatoes. When the virgin forests of Llanquihue were burnt down for the benefit of the German settlements, the potato was the most common of all the natural plants which reappeared spontaneously. We find it growing at

the summit of the highest and steepest saddles of the Cordilleras, which man seldom visits.

The starchy farina extracted from the potato is known as chuno, and is specially well prepared in the southern parts of Chile, and used as a light digestible aliment for convalescents and children.

MRS. L. GROVE.—*Royal Scottish Geographical Magazine*, March 1894.

By permission of the writer and of the Royal Scottish Geographical Society.

Santiago

"Let us go and breakfast in Santa Lucia," said the amiable and courtly admiral who entertained us. A short drive from the *plaza* takes us to the beautifully picturesque rock dominating Santiago, where Valdivia the conquistador camped with his hardy band, and where his statue still looks over the land he subdued with such rapacious cruelty, sealing his deed of conquest with his blood at the hands of the patriot Lautaro, who had been his horse-boy. The rock is now an exquisite lung for the great city, and you sit under trees of beauty amid flowers of every hue, or clamber up winding paths in stone and wood and iron to the platform on the top, and look over an unequalled scene of grandeur. For Santiago is 1800 feet above the sea, and Santa Lucia some hundred feet higher, while the city lies in a great plain surrounded by mountains. No, these trifling hills towards the coast are only some 8000 feet high, and look bare and burnt most of the time. The Unter den Linden sinks into insignificance before this noble alameda, two miles long, with a border of snow-capped Cordilleras looking over its gilded cupolas, its palatial government offices, its private dwellings (where the owners can lose themselves, especially from their creditors), and its miserable hovels reeking of *aguardiente*. Cathedrals of course, and churches, for Santiago is a city of ecclesiastics, and there are columns of Carrara marble adorning them that take one's breath away.

While cacti, agaves, and eucalypti give a quaint finish to the otherwise rich and beautiful temperate vegetation, we had better leave the elegant precincts ere the sun goes down behind the coast Cordilleras, with its glory of colouring, and its afterglow on the Andes.

W. A. SMITH.—*Temperate Chile*. Black.

By permission of Messrs. A. and C. Black.

Valparaiso

The aspect of Valparaiso from the sea is very remarkable. One would think a more inconvenient site was nowhere to be found. Rome was built, so historians tell us, upon seven hills, but Valparaiso is built upon twenty, and so steep are most of them that staircases are necessary to get from one part to another, and in one instance even a vertical railway has to be employed. The harbour of Valparaiso is of a horse-shoe shape, open to the north, but well protected on the south-west. It is unfortunate that it should be so exposed on the north, for occasionally northern gales are so heavy that the vessels have to slip their cables and put out to sea. The entire harbour is filled with sail and steam craft of every description as we enter and anchor in 150 feet of water. The appearance of Valparaiso may perhaps be likened to a vast amphitheatre, in which the ridges of the hills may be regarded as aisles. Its sloping position reminds one of Hong-Kong. Its spurs, terminating in bluffs at the water's edge, recall Quebec. Owing to the presence of these spurs, the city is, of course, very irregularly built. On one place there are but two streets between a rocky bluff and the harbour, while in another there are ten. The greater part of the city is built upon a gently sloping plain, and the streets are laid out with square or oblong blocks.

F. VINCENT.—*Around and About South America*. Appleton : New York.

By permission of Mr. F. Vincent and Mr. D. Appleton.

Across the Desert of Atacama

Proceeding from the Chilian port of Antofagasta we travel in nearly a north-easterly direction. We do not leave Chilian territory until we are some 50 miles beyond Ascotan. From the coast to within 40 miles of Ascotan we traverse the great desert of Atacama, which, excepting a few isolated spots, is entirely devoid of vegetation. The air is very dry, and during the day the rays of the sun beating down on the seemingly endless plains of burning sand are almost insupportable. The desert has, however, its oases, such as the old Indian village of Calama, through which the line passes (8000 feet above sea-level); and these, with their small corn patches, etc., present refreshing sights indeed. In the hills which encroach on and bound this desert there are mines of silver, etc., and many strange and dismal stories are related of prospectors who have set out in search of them, for the traveller who loses his way here has little chance of returning.

A waggon-road from the Huanchaca silver-mines in Bolivia to Antofagasta (now supplanted by the railway) can be easily traced by the bones of horses and mules that have perished by the way. The climate on the northern part of the coast of Chile is rather warm, but pleasant enough except for the absence of rain. As one proceeds into the more elevated interior, the heat continues during the day, but the nights are cold, as there are no great heat-storing bodies of water to equalise, to some extent, the temperatures of day and night. The air, indeed, is so dry that carcasses of dead mules completely mummified are a common sight; and the hands and face of the traveller are cracked by hot wind and sand. Another effect of the dryness of the air is the electric sparks produced by merely stroking the neck of a horse or mule. One who has crossed this desert on horseback or in a cart, or worse still on foot, can truly appreciate the advantages derived from the introduction of the locomotive

Towards the hills there are ravines, wide and deep cut, but now perfectly dry. The mountains are volcanoes, some still semi-active, others perpetually snow-tipped. On their sides may be seen the gorges, red- and yellow-coloured, down which have poured streams of molten rock, and the foot-hills are strewn everywhere with masses of volcanic slag, rendering travelling difficult and tedious. There is no rain, and no life of any kind, vegetable or animal. The endless undulations of the sandy desert, the weird and dismal valleys through which no water flows, the verdureless foot-hills bestrewn with fantastically-shaped heaps of lava, the red-scarred, smoking mountains, which seem but recently to have finished their work of destruction, and the eternal silence everywhere, combine to form a scene of the utmost desolation.

One bright streak in this dreary scene is the Loa, which, though only a rivulet, ranks as a river in this country. One might ride over the flat lava-strewn plains through which it mostly flows without even suspecting its existence, as it runs in a gorge with steep, sometimes almost perpendicular, sides over 300 feet deep, and only about 800 feet apart at the top. Its water is cold and pellucid in the desert, and its grassy banks are lined with water-cresses. Farther up the stream are hot springs where the Indians have constructed a rude open-air bath. Wild duck and geese frequent the river. Up in the rocks are caves where the Indians live to whom belong the sheep and cattle that graze by its waters, and who also own the numerous dogs that make for the unwary traveller.

Nitrate deposits exist and are worked on the desert near Antofagasta, similar to the well-known ones of Tarapaca, but on a much smaller scale.

From Conchi (10,000 feet high) onward to Ascotan, the climate gets distinctly colder, although it is rarely very cold for long after the sun is up, even during snow-storms. From May to September the nights are intensely cold, and everything capable of freezing is solidified. For about 50 miles beyond Ascotan we cross the first great

chain of the Andes, and the scenery on every side is of a grand character, but all too barren to be beautiful, and the eye soon wearies of the somewhat similar contours of the mountains. The climate, however, commences to be of a less trying character: there is less difference of temperature between night and day, and the air seems to be less keen—perhaps it contains more moisture, for we are coming into a country which has its regular rainy season from October to March.

We now find springs and pools of water at no very distant intervals; and instead of one great desert we have pampas, sometimes bare, and sometimes (like the spurs of hills which divide them up) covered with a scanty vegetation of scrub. The pampas are perfectly flat, often almost horizontal, and when bare look like sheets of water, while the small, isolated hills which suddenly rise up from them might be taken for islands.

This effect is further intensified by the well-known illusions of the mirage, so prevalent on hot deserts. Many of the barren pampas are covered with a white saline efflorescence, which renders the use of coloured spectacles necessary during the bright sunshine; on a cold, clear, moonlight night it has all the appearance of snow.

The Pampa Pelada (*pelada* means hairless or bald), some 160 miles north-east from Ascotan, is of a remarkable extent. It is a large stretch of nearly level red clay, in some directions extending to the horizon. There is a slight declivity to the westward, and one or two salt streams trickle slowly through it in that direction. The clay is 4 or 5 feet deep, and overlies dark bluish fine sand, the two being separated by a thin layer of the costra before mentioned. At about its narrowest point, where the railway crosses it, the width is over 20 miles; at other places it widens out immensely. It is absolutely without a trace of vegetation, and during the rainy season is entirely submerged in water to a depth of 2 feet more or less, so that the railway presents the singular appearance of a small clay embankment running through a great lake.

At the western extremity lies an immense salt lake having no outlet that I am aware of. The evaporation, however, in this country must be very great, considering the prevailing dryness. This lake is fed by several saline streams flowing down from the mountains, whence they bring their salt. As the dry season sets in, these streams diminish or dry up; and as the waters of the lake fall (by evaporation) a thick crust of salt is formed round its edges. During the dry months Indians may be met, with flocks of numberless llamas, carrying salt to the different establishments where this article is used in the reduction of minerals. They probably take away some thousands of tons each year, but the rains annually obliterate all trace of excavation. The Indians cut it with axes in blocks about 18 inches square and 4 to 6 inches thick, and load two of these on each llama. The salt is said to be nearly chemically pure, and some of it is beautifully white. The Pampa Pelada is therefore a dangerous place to get lost on at night, as a person may easily perish in the soft salt flats which surround the lake. One can see carcasses of animals which have probably strayed there in search of water, stuck fast, generally in an upright position, and completely covered by a thick coating of salt.

On the north side of the Pampa Pelada, some 420 miles from Antofagasta, the line divides into two branches, one going to the Huanchaca silver-mines, and the other to the town of Oruro. At this junction, Uyuni, there has grown up quite a village of more or less modern fashion, consisting for the most part of stores and mineral agencies. We now travel in an almost northerly direction to Oruro. Although we descend but little from the level of 12,000 feet above the sea, there is now vegetation in the form of brushwood and rank grass both on the pampas and foothills. Cacti also abound on the otherwise almost barren hills, and little forests of them may be seen, their trunks shooting up from 20 to 30 feet high. Some of these cactus-plants bear pretty flowers, and others produce deliciously refreshing fruit, such as the prickly-pear. Many

varieties are small, growing along the ground; and as all are plentifully supplied with long sharp thorns, it is advisable to look well before sitting down. At the different ranchos or clusters of huts and villages there are small enclosures of cultivated ground; we also pass an occasional *hacienda* or farm.

As we approach Oruro the welcome sight of occasional trees meets the eye—small and stunted they are, it is true, but still trees; and I have even seen roses blooming at the village of Huari, some 60 miles south of Oruro.

D. R. URQUIHART.—*Scottish Geographical Magazine*, June 1894.

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Passes from Chile to Argentina

There are two Andean passes by which Chilo may be reached from Mendoza. One is the Portillo, leading toward Santiago, between the lofty summits of Tupungato and Maypu. The other is the Uspallata or Cumbre, which follows the river Mendoza to its sources in the heart of the Andes; and the Aconcagua and other mountain torrents from the central summit to the Colorado valley and the high levels of Santa Rosa. The first path is the shorter and more precipitous, receiving its name from an overhanging shelf of rock at one of the entrances which resembles a doorway. It is 13,780 feet at the highest, and is very dangerous in winter. The Uspallata is the main highway between the Argentine and Chile. Its extreme height is 12,780 feet above the sea; it lies near Aconcagua, the loftiest summit of the Cordillera between Panama and the Straits, and it involves a journey of 225 miles from Mendoza to Santa Rosa, better known as Los Andes. Mr. Darwin, in his celebrated excursion to the Cordilleras, entered the Argentine by the Portillo and returned to Chile by the Uspallata, his record of observations on the physical features of the country remaining



TRONADOR, A PEAK IN THE SOUTHERN ANDES.

a most trustworthy work of reference on that section of the mountains.

I N. FORD.—*Tropical America*. Edward Stanford.

By permission of Mr. Edward Stanford.

Crossing the Portillo Pass

Leaving Santiago, we crossed the wide burnt-up plain on which that city stands, and in the afternoon we arrived at the Maipu, one of the principal rivers in Chile. The valley, at the point where it enters the first Cordillera is bounded on each side by lofty barren mountains, and although not broad it is very fertile. Numerous cottages were surrounded by vines, and by orchards of apple, nectarine, and peach trees—their boughs breaking with the weight of the beautiful fruit. In the evening we passed the custom-house, where our luggage was examined. The frontier of Chile is better guarded by the Cordillera than by the waters of the sea. There are very few valleys which lead to the central ranges, and the mountains are quite impassable in other parts by beasts of burden.

As we ascended the valley, the vegetation, with the exception of a few pretty alpine flowers, became exceedingly scanty; and of quadrupeds, birds, or insects, scarcely one could be seen. The lofty mountains, their summits marked with a few patches of snow, stood well separated from each other; the valleys being filled up with an immense thickness of stratified alluvium. The features in the scenery of the Andes which struck me most, as contrasted with the other mountain chains with which I am acquainted, were the flat fringes sometimes expanding into narrow plains on each side of the valleys; the bright colours, chiefly red and purple, of the utterly bare and precipitous hills of porphyry; the grand and continuous wall-like dykes; the plainly divided strata which, where nearly vertical, formed the picturesque and wild central pinnacles, but, where less inclined, composed the great massive mountains on the outskirts of the range; and

lastly, the smooth conical piles of fine and bright-coloured detritus which sloped up at a high angle from the base of the mountains, sometimes to a height of more than 200 feet. As evening drew to a close, we reached a singular basin-like plain, called the Valle del Yeso. It was covered with a little dry pasture, and we had the pleasant sight of a herd of cattle amidst the surrounding rocky deserts. The valley takes its name of Yeso from a great bed, I should think at least about 2000 feet thick, of white, and in some parts quite pure, gypsum. We had slept with a party of men who were employed in loading mules with this substance, which is used in the manufacture of wine. We set out early in the morning (21st), and continued to follow the course of the river, which had become very small, till we arrived at the foot of the ridge that separates the waters flowing into the Pacific and Atlantic oceans. The roads, which as yet had been good, with a steady but very gradual ascent, now changed into a steep zigzag track up the great range, dividing the republics of the Chile and Mendoza.

About noon we began the tedious ascent of the Peuquenés ridge, and then for the first time experienced some little difficulty in our respiration. The mules would halt every 50 yards, and after resting for a few seconds the poor willing animals started of their own accord again. The short breathing from the rarefied atmosphere is called by the Chilenos *puna*, and they have most ridiculous notions concerning its origin. Some say, "all the waters here have *puna*"; others that where there is snow there is *puna*,—and this no doubt is true. The only sensation I experienced was a slight tightness across the head and chest, like that felt on leaving a warm room and running swiftly in frosty weather. There was some imagination even in this; for upon finding fossil shells on the highest ridge, I entirely forgot the *puna* in my delight. Certainly the exertion of walking was extremely great, and the respiration became deep and laborious; I am told that in Potosí (about 13,000 feet above the sea) strangers do not

become thoroughly accustomed to the atmosphere for an entire year. The inhabitants all recommend onions for the *puna*; as this vegetable has sometimes been given in Europe for pectoral complaints, it may possibly be of real service,—for my part I found nothing so good as the fossil shells. About half-way up we met a large party with seventy laded mules. It was interesting to hear the wild cries of the muleteers, and to watch the long descending string of the animals; they appeared so diminutive, there being nothing but the bleak mountains with which they could be compared. When near the summit, the wind, as generally happens, was impetuous and extremely cold. On each side of the ridge we had to pass over broad bands of perpetual snow, which were now soon to be covered by a fresh layer. When we reached the crest and looked backwards, a glorious view was presented. The atmosphere resplendently clear; the sky an intense blue; the profound valleys, the wild broken forms; the heaps of ruins, piled up during the lapse of ages; the bright-coloured rocks, contrasted with the quiet mountains of snow,—all these put together produced a scene no one could have imagined. Neither plant nor bird, excepting a few condors wheeling round the higher pinnacles, distracted my attention from the inanimate mass.

Having crossed the Peuquenes, we descended into a mountainous country, intermediate between the two main ranges, and then took up our quarters for the night. We were now in the republic of Mendoza. The elevation was probably not under 11,000 feet, and the vegetation in consequence exceedingly scanty. The root of a small scrubby plant served as fuel, but it made a miserable fire, and the wind was piercingly cold. Being quite tired with my day's work, I made up my bed as quickly as I could, and went to sleep. About midnight I observed the sky became suddenly clouded; I awakened the *arriero* to know if there was any danger of bad weather, but he said that without thundering and lightening there was no risk of a heavy snowstorm. The peril is imminent, and the difficulty

of subsequent escape great, to any overtaken by bad weather between the two ranges.

At the place where we slept water necessarily boiled, from the diminished pressure of the atmosphere, at a lower temperature than it does in a less lofty country. Hence the potatoes, after remaining for some hours in the boiling water, were nearly as hard as ever. The pot was left on the fire all night, and next morning it was boiled again, but yet the potatoes were not cooked. I found out this, by overhearing my two companions discussing the cause; they had come to this simple conclusion, "that the cursed pot (which was a new one) did not choose to boil potatoes."

We travelled across the intermediate tract to the foot of the Portillo range. In the middle of summer cattle are brought up here to graze; but they had all now been removed; even the greater number of the guanacos had decamped, knowing well that if overtaken here by a snowstorm they would be caught in a trap. We had a fine view of a mass of mountains called Tupungato, the whole clothed with unbroken snow, in the midst of which there was a fine blue patch, no doubt a glacier,—a circumstance of rare occurrence in these mountains. Now commenced a heavy and long climb, similar to that of the Peuquenes. Bold conical hills of red granite rose on each hand; in the valleys there were several broad fields of perpetual snow. When nearly on the crest of the Portillo, we were enveloped in a falling cloud of minute frozen spicula. This was very unfortunate, as it continued the whole day, and quite intercepted our view. The pass takes its name of Portillo from a narrow cleft or doorway on the highest ridge, through which the road passes. From this point, on a clear day, those vast plains which uninterruptedly extend to the Atlantic Ocean can be seen. The descent on the eastern side of the Cordillera is much shorter or steeper than on the Pacific side; in other words, the mountains rise more abruptly from the plains than from the Alpine country of Chile. A level and brilliantly white sea of clouds was stretched out beneath our feet,

shutting out the view of the equally level pampas. We soon entered the band of clouds, and did not again emerge from it that day. About noon, finding pasture for the animals and bushes for firewood at Los Arenales, we stopped for the night. This was near the uttermost limit of bushes, and the elevation, I suppose, was between 7000 and 8000 feet.

Early in the morning I climbed up a mountain on one side of the valley, and enjoyed a far extended view over the pampas. This was a spectacle to which I had always looked forward to with interest, but I was disappointed; at the first glance it much resembled a distant view of the ocean, but in the northern parts many irregularities were soon distinguishable. The most striking feature consisted in the rivers, which, facing the rising sun, glittered like silver threads, till lost in the immensity of the distance.

DARWIN.—*Voyage of the "Beagle."* Ward and Lock.

Tupungato

Tupungato is a mountain about 22,000 feet in height, on the great chain which forms the water-parting, and at the same time the frontier boundary, between Argentina and Chile. It is roughly in latitudes $33^{\circ} 20'$ S. and long. $69^{\circ} 45'$ W., 50 miles east of Santiago, and 120 miles from the Pacific coast.

On 11th April, Mr. Vines, with Zurbriggen and a porter, slept at the same bivouac at 17,000 feet. An early start was made on the 12th, and, the weather being bright and clear, they calculated to reach the summit at about two in the afternoon. The summit proved to be much higher and further off than we had expected, and it was not until four o'clock that Mr. Vines and Zurbriggen reached it. Fifty miles to the north-west, Aconcagua stood up alone like a huge rock out of a sea of lower mountains. There was nothing between to interrupt the view. Mr. Vines took several photographs of Aconcagua, both from the ridge and from the summit of Tupungato.

To the north-east the Cerro de la Plata stood up from a great mass of high mountains. Turning further from the north and looking due east, the Cerro became very low, and almost disappeared in the low hills sloping down to the pampas not 15 miles east of Tupungato. The rivers winding through the great plain, and even the railways, could be clearly seen. The southern aspect could only be scanned from the summit. The volcano of San José de Maipu was the chief feature in this direction. The great frontier boundary line, of which Tupungato and its great spur form part, the water-partings of the rivers to the Pacific and Atlantic, were very clearly marked to the north, 40 or 50 miles away beyond the Cumbre Pass, and far to the south to Maipu.

Beyond the northern end of the great ridge lay a col covered with snow and ice, rising up to the beautiful ice-peak of Pollera, 19,000 feet in height, then another col, and the great pyramid of Navarro, some 500 feet higher, and beyond the great peaks and glaciers of Juncal, 1000 feet higher still.

From Maipu the water-parting runs due north to Tupungato, and then the line of the great peaks turns to the north-west and west to the Cumbre Pass, where the water-parting again runs north. While climbing up the ridge from the eastern side, and gradually nearing the top of it, the party noticed a strong, sulphurous, burning smell, and on arriving on the top of the ridge a volcano was seen about 20 miles to the south-west in great activity. The wind had blown from the west, bringing the smell towards Tupungato, but, as seen, it came from the north-west, and great volumes of smoke stretched away to the south. It had the appearance of a great ridge, about 13,000 feet in height, running towards the north, when its height gradually dwindled. A great fissure appeared in the middle of this ridge, from which the smoke poured forth in dark brown volumes. Nothing could be seen of this during the earlier attempts on the mountain, as the view to the west had been obscured by

clouds. The coast-line could be seen clearly, running for 100 miles to the north.

The breadth of the Cordilleras at this point was 60 miles only. They seem to narrow down at this latitude. The great plain in which Santiago is situated is not more than 45 miles to the west from Tupungato. Those 45 miles between Tupungato and Santiago are filled with range after range of high mountains. But from the top of Tupungato eastwards a man can look almost down into the great plain of the pampas. North of here the Cordilleras widen out, until at the latitude of $32^{\circ} 50'$ they rise up from Mendoza and continue almost to the sea-coast, a distance of 150 miles.

E. A. FITZGERALD.—*Geographical Journal*, November 1898.

By permission of the Royal Geographical Society.

Crossing the Uspallata or Cumbre Pass

After passing the long Alameda of Mendoza, the road, for about two leagues, passes through a country artificially irrigated by the Rio de Mendoza, and its luxuriance and fertility are quite extraordinary. The brown mud walls which bound the road are covered with grapes, hanging down in beautiful clusters; and the number of peach trees, laden with fruit, and scattered among rich crops of corn and other agricultural produce, gave the scene an appearance of great luxury and abundance; while the mountains of the Cordillera formed a magnificent boundary to the picture. As soon as the line of irrigation is passed, the country suddenly ceases to be productive. The soil, light and sandy, produces no sort of herbage, and for more than 30 miles the road, as it approaches the mountains, passes through a plain, which bears nothing but low, stunted shrubs. The road across this flat country is always tedious, for the mountains, on leaving Mendoza, appear within 3 or 4 miles of the town, and the path seems literally to lengthen as one goes. At length we got to the first ravine of the Cordillera; and then, with

the whole noble mountains towering over our heads, sometimes lost in darkness, and sometimes faintly traced by the few stars which were visible, we followed the sound of the water until the distant light at the post-hut informed us that we should now cross the stream, and we then rode up to the post. I found the road, on leaving Villa Vicencia, suddenly turns up a ravine, which is one of the finest passes in the Cordillera.

The mountains are extremely deep on both sides, and, as the ravine winds in many directions, one often comes to a spot which has the appearance of a cul-de-sac, from which there is no exit to be seen. In some places the rock hangs perpendicularly overhead, and the enormous fragments which nearly block up the road, contrasted with those which seem to be on the point of falling, add to the apparent danger and grandeur of the scene. We gained, by a constant ascent, the summit of the Paramillo, the high range of mountains which overhang Villa Vicencia. The view from this point is very interesting. The ground continues level for a short distance, and then rapidly descends towards the valley of Uspallata, which is about 30 miles off. This valley is the upper base of the great range of the Cordillera; and it is, at first, surprising to see that the hills of the Paramillo, which had appeared so lofty, are very humble features, compared with the stupendous barrier which, in spite of its distance, appears to be now on the point of obstructing the passage. This enormous mass of stone—for it appears to be perfectly barren—is so wild and rude in its features and construction that no one would judge that an animal could force its way across the summit, which, covered with snow, in some places eternal, seems to be a region between the heavens and the practical habitation of man; and indeed an attempt to pass it, except by following up in a ravine the course of a torrent, would be altogether impossible. Descending the hill, we came to the district in which the Uspallata mines are situated. The climate of the country in which these mines are situated is what would naturally be

expected from its latitude and elevation. The former places it under a hot sun, the latter imparts to it a considerable degree of cold ; and as the air is both dry and rarefied, there is little refraction, and consequently the heat and light of day vanish almost as soon as the sun is below the horizon.

The mountains now seemed to be actually over our heads, and we expected that we should have immediately to climb them ; but for many hours we went over a plain as dry and barren as the country already described on the other side of Uspallata, and which wound its course among the mountains. At last we crossed a rapid torrent, and then immediately came to another which takes its rise at the summit of the Andes, and whose course and comparatively gradual descent direct the passage. It is on gaining this spot that the traveller may proudly feel he is at last buried among the mountains of the Andes. As I was looking up at the region of snow, and as my mule was scrambling along the steep side of the rock, the *capataz* overtook me, and asked me if I choose to come on, as he was going to look at the "Ladora de las Vacas," to see if it was passable, before the mules came to it. We accordingly trotted on, and in half an hour we arrived at the spot. It is the worst pass in the Cordillera. The mountain above appears almost perpendicular, and is one continued slope down to the rapid torrent which is raging underneath. The surface is covered with loose earth and stones which have been brought down by the water. The path goes across this slope, and is very bad for about 70 yards, being only a few inches broad ; but the point of danger is a spot where the water which comes down from the top of the mountain either washes the path away or covers it with loose stones. We rode over it, and it certainly was very narrow and bad. In some places the rock almost touches one's shoulder, while the precipice is immediately under the opposite foot, and high above the head are a number of large loose stones, which appear as if the slightest touch would send them rolling into the

torrent beneath, which is foaming and rushing with great violence. However, the danger to the rider is only imaginary, for the mules are so careful, and seem so well aware of their situation, that there is no chance of their making a false step. We then continued our course for two hours, until we came to the "Rio de las Vacas," which is the most dangerous torrent of any of those which are to be crossed. We got through it with safety, but it was very deep, and so excessively rapid, that large stones were rolled down it with the force of the water. After passing the Rio de las Vacas, the ravines appear to grow narrower and steeper, and the tops of the mountains, which are those of the highest range, are rugged, with sharp edges and pinnacles. We here came to a quantity of snow and rubbish, which had been washed down, and which we had great difficulty to pass, for it occasionally broke under the weight of the mules, who recovered themselves in a surprising manner, and as if accustomed to it.

We now passed one of the brick huts, which, at every two or three leagues, have been built to protect the traveller from the dreadful snowstorms which here assail him, and after continuing our course till the sun was low, we stopped at the second of these huts. The torrent which we had so long followed now turned up the ravine to the right. We had pursued it from the east towards the west, but our path was now obstructed by the Cumbre or upper ridge of the Cordillera, which no artifice can avoid, and which is a mountain covered with loose, decomposed rock, at an angle of very nearly 45°. At the foot is another of the huts, without door, stable, or lintel, and in which many people have died. The path ascended in zigzags from the bottom to the top, and the whole time I was obliged to hold on by the thin mane of the mule. The turnings were so short, that the animal was almost falling backwards; however, on he went, with a determination and patience that was quite astonishing. At times he stopped, but the path was so steep, and the decomposed rock so loose, that of his own accord in a few

seconds he continued. It was very picturesque and interesting to see the whole party beneath, threading their way in different paths above each other, some going towards the north, and others towards the south; to see the riders leaning forwards, every animal straining to his utmost; and to hear the *peons* below cheering on their mules by a song which was both wild and melodious. After climbing in this singular manner for about an hour, I reached the summit, and it was really a moment of great triumph and satisfaction. Hitherto I had always been looking upwards, but now the difficulties were all overcome, and I was able to look down upon the mountains. Their tops were covered with snow; and as the eye wandered over the different pinnacles, and up the white trackless ravines, one could not but confess that the scene, cheerless and inhospitable as it appeared, was nevertheless a picture both magnificent and sublime.

After descending about a mile with great trouble and difficulty, we came to another of the huts, which was in the same state as all the rest, but surrounded by about 12 feet of snow; for on the Chile side of the Andes there is always much more snow than the other. Continually descending, the mountains soon began to assume a different appearance; and when we afterwards came to the first trees, we fancied that we were beholding a most beautiful country, and our whole party were making repeated observations on the particular charms of the scenery.

SIR F. HEAD.—*Rough Notes.*

View from the Summit of Aconcagua

The western and north-western sides of the mountain fall away at an angle of 20° , and are composed more or less of great slopes of loose stones, which are kept clear of snow in summer by the winds that sweep them. To the south and south-west the sides are more precipitous, also fairly clear of snow and ice; but to the south-east there is an enormous precipice of nearly 10,000 feet, covered with

great overhanging masses of snow and ice, forming one of the most imposing sights imaginable.

Looking down this dizzy precipice, Mr. Vines saw below him spurs of the mountain flanking the glacier beneath to the right and left, giving it the appearance of a huge amphitheatre. The sun was now not far off the horizon, and did not penetrate into this vast pit. Great masses of vapour were moving about in it far below, giving it the appearance of some giant cauldron, it being impossible to see the bottom, 2 miles vertically below where he stood.

The sky was still clear to the north. To the north-west the line of the Pacific stood up high on the horizon, stretching away for over 150 miles. Range after range of mountains could be clearly seen between Aconcagua and the ocean. He seemed to look right down into the valleys between these two ranges. The first striking feature to the north was the Val Penitentes, beginning in glacier, and stretching for 15 or 20 miles in a straight line to the north. Forty miles away, following the line of the Val Penitentes, stood the great snow mass of Mercedario, towering above all the surrounding ranges. The southern side of this peak is a gentle snow-slope, while the northern side would doubtless consist of slopes free from snow, as was the case on Aconcagua.

Of the pampas or great plains of Argentina he could see nothing; there were too many ranges of high mountains between Aconcagua and Mendoza to make this possible. But to the south the clouds, fortunately, were not high enough to cut off the magnificent view of Tupungato, and the great range to the north of it, with the beautiful peaks of Pollera, Nevardo, and Juncal, which so distinctly mark the boundary-line between the two republics. The eastern side of Aconcagua sloped down to the great bare wastes at the head of the Vacas valley, which ended in glacier. An easy passage of mules could be made over from here into the Penitentes valley, and so to the north. The clouds soon lifted in the Horcones

valley, and cut off all possible view of Tupungato.

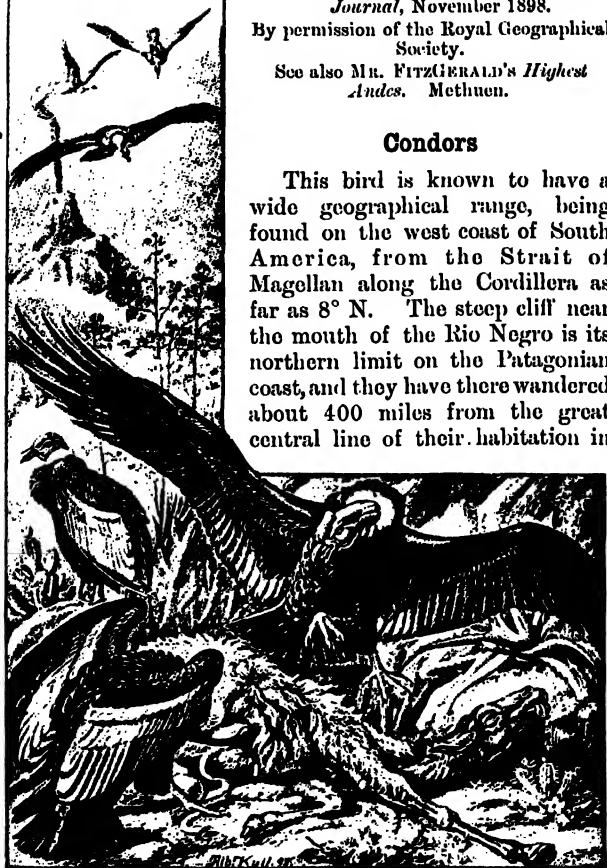
E. A. FITZGERALD.—*Geographical Journal*, November 1898.

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See also MR. FITZGERALD'S *Highest Andes*. Methuen.

Condors

This bird is known to have a wide geographical range, being found on the west coast of South America, from the Strait of Magellan along the Cordillera as far as 8° N. The steep cliff near the mouth of the Rio Negro is its northern limit on the Patagonian coast, and they have there wandered about 400 miles from the great central line of their habitation in



CONDORS.

the Andes. Farther south, among the bold precipices at the head of Port Desire, the condor is not uncommon; yet only a few stragglers occasionally visit the sea-coast. A line of cliff near the mouth of the Santa Cruz is frequented by these birds, and about 80 miles up the river, where the sides of the valley are formed by steep basaltic precipices, the condor reappears. From these facts it seems that the condors require perpendicular cliffs. In Chile they haunt, during the greater part of the year, the lower country near the shores of the Pacific, and at night several roost together in one tree, but in the early part of the summer they retire to the most inaccessible parts of the Inner Cordillera, there to breed in peace. With respect to their propagation, I was told by the country people in Chile that the condor makes no sort of nest, but in the months of November and December lays two large white eggs on shelf of bare rock. It is said that the young condors cannot fly for an entire year; and long after they are able, they continue to roost at night, and hunt by day with their parents. The old birds generally live in pairs; but among the inland basaltic cliffs of Santa Cruz I found a spot where scores must usually haunt. On coming suddenly to the brow of the precipice, it was a grand spectacle to see between twenty and thirty of these great birds start heavily from their resting-place and wheel away in majestic circles.

DARWIN.—*Voyage of the "Beagle."* Ward and Lock.

Galapagos Islands

This archipelago consists of ten principal islands, of which five exceed the others in size. They are situated under the equator and between 500 and 600 miles westward of the coast of America. They are all formed of volcanic rocks; a few fragments of granite curiously glazed and altered by the heat can hardly be considered as an exception. Some of the craters surmounting the larger islands are of immense size, and they rise to a height of

between 3000 and 4000 feet. Their flanks are studded by innumerable smaller orifices. I scarcely hesitate to affirm that there must be in the whole archipelago at least 2000 craters. These consist either of lava and scorïæ or of finely-stratified sandstone-like tuff. Most of the latter are beautifully symmetrical; they owe their origin to eruptions of volcanic mud without any lava; it is a remarkable circumstance that every one of the twenty-eight tuff-craters which were examined had their southern sides either much lower than the other sides or quite broken down and removed. As all these craters apparently have been formed when standing in the sea, and as the waves from the trade-wind and the swell from the open Pacific here unite their forces on the southern coasts of all the islands, this singular uniformity in the broken state of the craters composed of the soft and yielding tuff is easily explained. Considering that these islands are placed directly under the equator, the climate is far from being excessively hot; this seems chiefly caused by the singularly low temperature of the surrounding water brought here by the great southern polar current.

Excepting during the one short season, very little rain falls, and even then it is irregular, but the clouds hang low. Hence generally, while the lower parts of the islands are very sterile, the upper parts, at a height of 1000 feet and upwards, possess a damp climate and a tolerably luxuriant vegetation. This is especially the case on the windward sides of the islands, which first receive and condense the moisture from the atmosphere.

DARWIN.—*Voyage of the "Beagle."* Ward and Lock.

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